EU-MERCI

EU coordinated **ME**thods and procedures based on **R**eal **C**ases for the effective implementation of policies and measures supporting energy efficiency in the **I**ndustry

HORIZON 2020 Project Nr. 693845

Comparative report on technical specificities of EEOSs and alternative measures for the EED implementation

Deliverable D1.1

Version 1.3

WP1: Review of EEOSs and alternative measures in EU

Deliverable Editor: JIN

WP leader: JIN

Project leader: RSE

Release on: September 2016

Dissemination level: Public

History of changes

Authors:

Version	Date	Author(s)	Notes
1.0	July 28th 2016	JIN with contribution from other partners	First issuing
1.2	Sept. 16th 2016	Update data	Final issuing
1.3	Nov. 30th 2016	Update data	Added EAO Slovenia

Reviews:

Version	Date	Reviewer(s)	Notes
1.1	Aug. 8th 2016	KAPE	Technical Revision
1.1	Sept. 1st 2016	RSE	Revision of the first issuing
1.1	Sept. 1st 2016	SEEA	Updates on their policies
1.1	Sept. 1st 2016	KAPE	Updates on their policies
1.1	Sept. 12th 2016	ADEME	Updates on their policies
1.1	Sept. 16th 2016	Maltese Government	Changes in their policies
1.1	Sept. 16th 2016	Ministry of Economic LUX	Updated data
1.1	Sept. 16th 2016	Ministry of Economic LV	Updated data
1.1	Sept. 16th 2016	Ministry of economics, DE	Confirmation of data
1.2	Sept. 16th 2016	RSE	Final revision and approval for delivery
1.3	Nov, 30th 2016	JIN, RSE	Revision

This report has been created under the EU-MERCI project, coordinated by RSE. In particular it is part of the WP1 activities. The following partners cooperated to this report: JIN (WP leader), CRES, AEA, KAPE, FIRE, Carbon Trust, ApE, ENERO

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The research leading to these results/this publication has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 693845.

Abstract

This report is a database on the most important energy efficiency policies, covering the targets of the EED (mainly under Article 7), in the industrial sector. The policies have been examined in all 28 Member States plus Norway and comparative results are presented. The analysis of each individual policy per Member State provides a general understanding of the policy, the methods for energy savings calculation used and the level of data requirements in order to verify the savings, and finally the process used for monitoring the materialization of savings.

Acknowledgements

The EU-MERCI team would like to thank Marcus Hoffman (AEA, AT), Tsvetomira Kulevska (SEEA, BG), Dean Smolar (CEI, HR), Evangelos Stougiannis (MCIT, CY), Jiri Karasek (SVN, CZ), Jacob Hogh (ENS, DK), Catherine Guermont Bernardi (ADEME, FR), Urs Engels (BMWI, DE), Christos Tourkolias (CRES, GR), Alan Ryan (SEAI, IE), Maris Doniks (Ministry of Economics, LV), Carla Oliveira (Ministry of Economics, LUX), Oyvind Leistad (ENOVA, NO), Tadeusz Skokowski (KAPE, PL), Luis Silva (ADENE, PT), Daniela Bouleanu (RO), Michal Nemeth (SIEA, SK), Mojca Vendramin (Ministry, SI), Charles Buttigieg (Energy and Water Agency, MT), Filip Ekander (SEA, SE) for their feedback in compiling this report.

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List of Abbreviations and Acronyms

Acronym	Meaning
EED	Energy Efficiency Directive (2012/27/EU)
EEO	Energy Efficiency Obligation
ESD	Energy Services Directive (2006/32/EU)

Information about the EU-MERCI project

EU-MERCI is a coordination and support action project funded by the European Commission under Horizon 2020 (nr. 693845), aimed at fostering and facilitating the implementation of energy efficiency projects in the manufacturing industry sectors by selecting and disseminating technological and policy best practices.

The project

EU-MERCI will identify best practices of implementation of energy efficiency projects, drawing from the experience of thousands real cases of application of energy efficiency support schemes in Europe, in order to support the effective implementation of the EU Energy Efficiency Directive (EED).

The collected case studies, disseminated through an extensive capacity building action, will allow industrial enterprises to catch the opportunities related to energy efficiency actions. Besides, the analysis of the existing energy efficiency support schemes will support policy makers in designing new support schemes or improving the existing ones. The lessons learnt from Member States with consolidated energy efficiency schemes in place will be transferred to less advanced Member States.

A stakeholder community dealing with industrial energy efficiency policies and actions will be created, to accelerate and facilitate the path toward the EU 2030 energy efficiency target, namely the 2030 framework for climate and energy policy (2014)[1], sets far reaching no binding key target for 2030 as at least 27% improvement in energy efficiency having in mind 30% EU target.

A repository of industrial best practices

A database of industrial best practices will be created through the analysis of the projects presented within the existing support schemes at EU level and the information collected via an extensive survey involving industries and their associations, industrial and trade chambers, and policy makers. This repository will be available to all the interested stakeholders through a dedicated web platform. Despite the rise of awareness in the last years, many energy efficiency actions are not implemented due to lack of knowledge, proved examples, and other information barriers. The collected best practices will help industrial enterprises to find out the best available solutions to improve their use of energy and increase their competitiveness, and will stimulate them by showing case studies and real achievements.

Support actions for industries

Besides the best practices repository available at www.eumerci.eu , EU-MERCI will support the implementation of energy efficiency projects in the industrial sector through dedicated conferences and workshops, available both in the EU-MERCI partners' Member States (Austria, Bulgaria, Greece, Italy, Romania, Slovenia, The Netherlands, the UK, Poland) and in the other Member States covered by SPES GEIE consortium for the agro-food industry (Belgium, Czech Republic, France, Hungary, Portugal, Spain, Turkey). Dedicated webinars will also allow for a wider attendance from all the

[1] A policy framework for climate and energy in the period from 2020 to 2030, COM(2014) 15 final.

Member States.

Support actions for policy makers

EU-MERCI will support policy makers to design new schemes and improve the existing ones. The analysis of the existing support policies for energy efficiency, together with the detailed investigation of the technological case studies, will offer a comprehensive view on the different issues of energy efficiency support schemes (energy savings measurement and verification, baseline, additionality, materiality, etc.).

Community of stakeholders

EU-MERCI will involve a substantial number of stakeholders at national and European levels in a wide range of activities - from the analysis to the dissemination of the energy efficiency best practices. This community will both act as supplier of relevant analysis, information and case studies, and as the beneficiary of the project outcomes. Social networks will help people to get and keep in touch and exchange information and experiences.

Partners

The project partners, working to seek, develop and disseminate best practices are:

Ricerca sul Sistema Energetico, Italy (RSE); JIN Climate and Sustainability, The Netherlands (JIN); Center for Renewable Energy Sources and Saving, Greece (CRES); Polish National Energy Conservation Agency, Poland (KAPE); Austrian Energy Agency, Austria (AEA); Italian Federation for Rational Use of Energy, Italy (FIRE); Carbon Trust, United Kingdom (Carbon Trust); Black Sea Energy Research Centre, Bulgaria (BSERC); Energy Restructuring Agency, Slovenia (ApE); Spread European Safety SPES GEIE (SPES); Centre for the Promotion of Clean and Efficient Energy in Romania, Romania (ENERO).

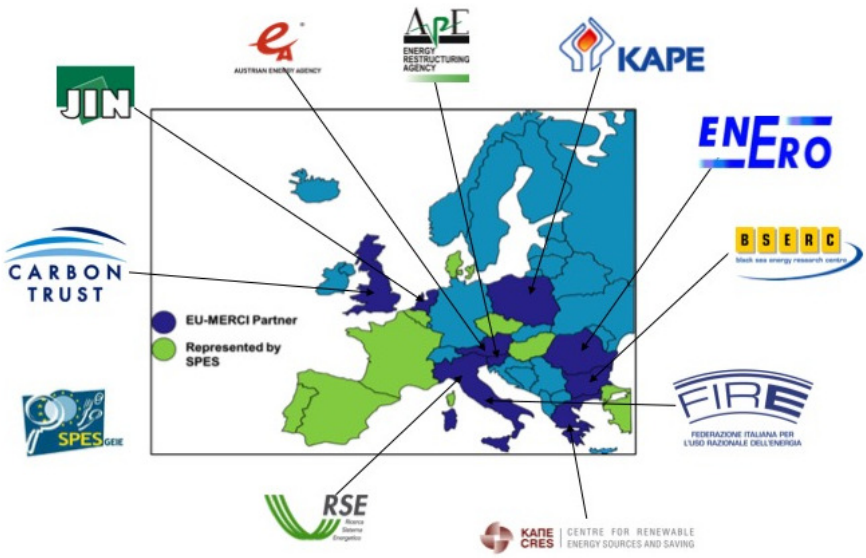

Figure 1. EU-MERCI partners

1 Austria

1.1 Energy Efficiency Obligation (EEO)[2]

1.1.1 Short description of the policy measure

The Austrian Federal Energy Efficiency Act has introduced an EEO to contribute to the implementation of Article 7 of the EED. The objective of the EEO is to achieve final energy savings between 2015 and 2020 that amount to 159 PJ in total. There is no restriction regarding eligible sectors. Energy efficiency measures that comply with 3.2.1, i.e. that reduce final energy consumption at final customers are eligible.

All retail energy sales companies that sell more than 25 GWh in the previous year are obligated parties. Between 2015 and 2020, the sales of the previous year determine the obligation of the respective. The obligation covers all energy carriers (electricity, natural gas, district heating, biomass, coal, mineral oil) including transport fuels. One requirement is that each obligated party has to achieve a 40 % of yearly savings with measures at households. The remaining 60 % of savings can be achieved in any end use sector (households, services, industry, transport, agriculture).

Type of policy measure	Obligation
Lifetime of the measure	2015-2020
Target groups	All industrial sectors
Target technology	No restrictions
Target energy savings	159 PJ (final savings in the period of 2015-2020)

Table 1. Main features of the Austrian EEO

1.1.2 Energy saving calculation (methods) and data requirements

In principal all methods (deemed savings, metered savings, scaled savings, and surveyed savings) are possible under the Austrian EEO scheme. A mix of all methods is expected with differences between sectors though. For measures in industry it will most likely not be possible to apply a deemed savings approach but to calculate savings based on metered consumption or engineering estimates. The applied methods in all sectors will eventually depend on the availability of deemed savings methods.

[2] Information on the EEO was obtained from the official EC notification of Austria (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results)

1.1.3 Monitoring and verification process

The Energy Efficiency Act only states that verification and monitoring have to be in line with the EED. There is an online database which is used by obligated parties to report the implemented energy efficiency measures on a yearly basis.

The monitoring body in the EEO scheme, the Austrian Energy Agency (partner in EU-MERCI) is a separate body to the Ministry. It is responsible for administering the online platform for registering energy savings. Industries and persons/organizations that have fulfilled requirements can upload data on implemented measures to this platform. Furthermore, auditors for buildings, transport and other sectors (which may be internal or external) are also allowed to upload data on the measures implemented. The monitoring body controls the uploaded data in terms of the information provided by the auditors and the actual investments realized and are based on a sampling size.

There are two different obligations:

a) Large companies are required to provide energy audits (and a summary report). The monitoring body evaluates the information of the summary report (which kind of measures, how high is the savings potential etc.). If the information is not clear or credible, the total report needs to be uploaded and evaluated.
b) Energy providers must report on the measures implemented which are verified by the monitoring body. The type of information that needs to be reported is the company size, type of measure (technology description, savings generated) but no costs. The monitoring body verifies the information, then reports on the analysis of savings and publishes a short report on the website with aggregated data reflecting which measures target industry or households.

1.2 Domestic environmental support scheme (UFI)[3]

1.2.1 Short description of the measure

The domestic environmental support scheme provides economic incentives for companies to implement measures in the field of energy efficiency, climate and environment protection. Subsidies are provided for energy efficiency measures and use of renewable energy sources in industry. In general, the subsidy covers 30 % of the environment- related investment costs. Higher or lower subsidy rates are foreseen in certain circumstances. The basis of this subsidy is regulated in the

[3] Information on the UFI was obtained from the official EC notification of Austria (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), the D3.1 report of the ENSPOL project (http://enspol.eu/results), and the 'Energy efficiency trends and policies in Austria' report by the Austrian Energy Agency, November 2015 (http://www.odyssee-mure.eu/publications/national-reports/energy-efficiency-austria.pdf).

federal law called „Umweltfoerdergesetz". The annual budget for these grants is more than 30 million € provided by the Austrian Ministry of Environment, with the "Oesterreichische Kommunalkredit" transacting the program. Beside this national initiative, there are several regional programs.

Type of policy measure	Financing and incentives
Lifetime of the measure	1986 - ongoing
Target groups	All businesses including industry
Target technology	Improving the energy efficiency of buildings, connection to district heating, installation of heat pumps or (large-scale) solar thermal systems, operational co-generation plants, energy-efficient lighting systems, alternative fuel vehicles and various mobility management measures.
Target energy savings	11,470 PJ (cumulative final, in the period of 2014-2020)

Table 2. Main features of the UFI scheme

1.2.2 Energy saving calculation (methods) and data requirements

Implementation of the measures has to be proved with 'standard report' documents. The information required from the companies for demonstrating energy savings depends on the types of measures. The information needs to be submitted online by the companies and should contain in general: a) the basic info (company, size, performance etc.), b) information per measure (e.g. for buildings data on the type of building, age, size etc.), and c) common information (e.g. person in charge, if there is an Energy Management System installed etc.). Scaled Savings are calculated based on evaluations of the subsidy program, and based on this the 'Benchmarking sample' tool has been developed, which comprises 11 branches with 52 sub-categories of activities.

1.2.3 Monitoring and verification process

Kommunalkredit Public Consulting (KPC, a private organization and external body to the Ministry) handles the applications from industries, meaning that they are controlling the eligibility of the investment to receive the subsidy. The monitoring mechanism does not really follow a specific timeframe or structure, but is carried out with random sampling. The dataset of the industrial savings and the subsidies provided is held and administered by the KPC, which also in turn reports to the Ministry.

1.3 Energy efficiency improvement of companies in the framework of the klimaaktiv program[4]

1.3.1 Short description of the measure

One of several Austrian klimaaktiv programs within the Austrian Climate Strategy is the national program for increasing energy efficiency in companies, which started in 2005 under the management of the Austrian Energy Agency. In order to find companies interested in reducing energy costs a wide base of marketing activities are set.

The klimaaktiv management (http://www.klimaaktiv.at/english.html) is assisted by market-partners for specific technologies, e.g. compressed air, variable speed drives, pumps, fans, lighting systems, steam systems and waste heat to satisfy the need of companies for very detailed and professional support. Information on these advanced technologies is distributed via newsletters and trainings. Until April 2015, more than 550 consultants have been educated about using tools for energy audits and about 200 companies have been awarded by the Minister of Environment for implementing energy efficiency measures.

Since 2008 specific PR-materials, tools, and a training concept for consultants for different technologies were developed: compressed air, pumps, fans, steam, cooling systems, lighting, and waste heat. In 2015 the program also includes the different possibilities to meter energy and calculate energy savings.

Type of policy measure	Information/education/training
Lifetime of the measure	2005 - ongoing
Target groups	Industry
Target technology	Multiple e.g. compressed air, variable speed drives, pumps, fans, lighting systems, steam systems and waste heat
Target energy savings	Not specified

Table 3. Main features of the energy efficiency measure

1.3.2 Energy saving calculation (methods) and data requirements

The companies are required to send a report of the measures they implemented in an online format (in the past it was being emailed with an excel format). In this report they make use of the

[4] Information on the klimaaktiv Program was obtained from the website of MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/AU9.PDF)

standardised list of measure per categories of technologies (there is a database with 230 measures from the industry - started in 2008) (http://www.klimaaktiv.at/english/savingenergy/topprodukte.html). Information needs to be provided on the situation before the installation of the measure and the situation after, the investment costs are not obligatory, but there is no formal requirement of an accompanying audit report.

1.3.3 Monitoring and verification process

The program is managed by the Ministry of Environment. The data submitted by the companies is being used only to verify the measures in order for the company to receive the award for implementing energy efficiency measures. Several companies/industries reporting to the Klimaaktiv also apply for the UFI scheme.

1.4 Energy taxes[5]

1.4.1 Short description of the measure

In Austria, electrical energy, natural gas and various petroleum products are taxed on the basis of the following three legal acts: Electricity Tax Act (BGBl. No 201/1996), Natural Gas Tax Act (BGBl. No 201/1996), Mineral Oil Tax Act (BGBl. No 630/1994). All three acts lay down higher tax rates than the EU Energy Taxation Directive (Directive 2003/96/EC).

Type of policy measure	Fiscal
Lifetime of the measure	Beginning of 20th century (tax on oil), 1995 (natural gas and electricity), 2004 (solid fuels for heating) - ongoing
Target groups	Crosscutting
Target technology	No specification
Target energy savings	76,361 TJ (cumulative saving in the period of 2014-2020)

Table 4. Main features of the energy efficiency measure

[5] Information on the energy taxes was obtained from the official EC notification of Austria (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D3.1 report of the ENSPOL project (http://enspol.eu/results)

1.4.2 Energy saving calculation (methods) and data requirements

The electricity and natural gas tax is based only on the final volume of energy consumed while the mineral oil tax is determined by the respective composition. There are no specific calculation methods for the industry for taxation.

1.4.3 Monitoring and verification process

Energy taxes are being monitored by a national monitoring body. Monitoring and controls are in accordance with Article 7(10)(h) and (i). A corresponding control and evaluation system for monitoring all essential targets under the EED is planned to be set up by Austria.

2 Belgium

Belgium is divided into three regions, namely Flanders, Wallonia and Brussels-Capital. These regions have separately drafted their own National Energy Efficiency Action plan and therefore implement the EED on their own territory. For this reason, monitoring related to the implementation of the EED also falls under the responsibility of each region.

2.1 Energy Efficiency Obligation (EEO) scheme[6]

2.1.1 Short description of the measure

The Flemish region of Belgium introduced an EEO in 2003. The Flemish regional government's Decision of 29 March 2002 concerning public service obligations for the promotion of rational use of energy (RUE Regulation) placed an obligation on electricity distributors as of 2003 to meet annual primary energy savings targets. The RUE Regulation was amended several times till 2011 when it was fully replaced. Before the 2007 amendments, almost any energy saving measure was eligible to count toward meeting the energy saving target. Since 2008, most soft measures are no longer counted toward achieving the primary energy saving target. The RUE obligation targets a variety of sectors including industry, households, services, transport, public lighting, energy sector and agriculture, which can all receive rebates/premiums when implementing energy saving measures.

Type of policy measure	EEO
Lifetime of the measure	2003 – ongoing
Target groups	Industry, households, services, transport, public lighting, energy sector and agriculture
Target technology	Typical measures in the non-residential sector include energy efficient lighting, variable speed drives, attic/ roof insulation, and energy efficient boilers.
Target energy savings	As of 2012, electricity distributors have no energy saving target but specific "action obligations".

Table 5. Main features of the Flemish EEO scheme

As of 2012, the energy saving targets for electricity distributors were eliminated and replaced by specific "action obligations," specific actions set forth by the Flemish Government that electricity

[6] Information on the Flemish EEO scheme was obtained from the D2.1.1 report of the ENSPOL project (http://enspol.eu/results)

distributors must implement. The main tools that electricity distributors have employed to stimulate energy savings have been rebates/premiums (proof of installation by means of invoice) to the different sectors targeted and financial assistance to municipalities to invest in energy saving measures, combined with informational campaigns via brochures and the internet, and energy audits/scans.

2.1.2 Energy saving calculation (methods) and data requirements

The Flemish Energy Agency (VEA) has not made public its approved energy saving calculation methods and resulting savings. The savings are pure deemed ex-ante estimations. From 2007, energy audits did not count toward the energy saving target, based on the finding that energy audits themselves do not lead to a predictable level of energy savings (because there is no obligation or follow up to implement saving measures). The only exception to this are mandatory energy scans required from 2007 on, which are seen as yielding some level of concrete savings as they require installation of certain energy savings measures.

Electricity distributors were required to submit yearly (by 1st May) a report on the data (number of supported measures per sector, realized savings per sector) of the preceding calendar year. They also required submitting their energy savings plans and calculation methods to the VEA for preapproval. They had to submit a description of all actions to be carried out by them to meet the target and include the method of calculation for primary energy savings. The Energy Agency approved the method of calculation. As the Flemish Energy Agency does not make approved calculation methods public, it is not possible to be more specific on this point.

2.1.3 Monitoring and verification process

VEA was the responsible body to check the submitted information and develop a summary report. Such piece of information was included in the annual evaluation report on energy efficiency measures implemented and the distributors' compliance with the obligation produced by VEA by October 1st. The resulting reports are not publicly available. Besides this check and evaluation report no other ways of verification or monitoring were applied (no checking of the correct implementation and realization of EE measures, ex-post evaluation of deemed savings etc.).

In 2010, VEA was required to prepare a detailed report to the Flemish Government on the results, costs, and effectiveness of energy savings under the RUE scheme. The report was submitted together with the global evaluation of the RUE obligations to the Flemish Government and led to the changed of the legislation as of 2012 (Final decision by Flemish Government on September 23, 2011). The new RUE obligation legislation no longer includes a predefined evaluation period. Evaluation will, however, take place along the way, largely motivated by the fact that the Flemish Government decided to compensate electricity distribution system operators for executing the obligatory actions (and paying premiums to the end-users) partially out of the Flemish Government's Budget. Because of this direct link with the Flemish Government's Budget, continuous evaluation of RUE obligations will be necessary.

2.2 Flanders voluntary agreements in energy intensive industry[7]

2.2.1 Short description of the measure

Voluntary agreements for the period of 2014-2020 signed between the Flemish government and various energy intensive industrial companies (at least 0.1 PJ per year) aim to improve energy efficiency and reduce the energy consumption of final consumers.

Type of policy measure	Voluntary agreements
Lifetime of the measure	2014 – 2020
Target groups	Energy intensive industrial companies
Target technology	All energy efficiency measures
Target energy savings	9505 GWh (2014-2017) 17110 GWh (2018-2020)

Table 6. Main features of the Flanders voluntary agreements

Companies are committed to

- develop a 4 year energy audit verified by a certified energy expert
- on the basis of the audit develop an Energy Plan that needs to be implemented periodically (first period should take place in the first 3 years of the Agreement period while the second period in the rest of the Agreement period). The Energy Plan needs to include at least
    - technical description of the establishment (including the main sub-processes and measuring instruments)
    - measured total annual energy consumption of the facility
    - measured annual energy consumption of the relevant energy processes
    - results of the analysis of the specific energy consumption of the establishment and its processing plants and identification of study measures, cost-effective and potentially cost-effective measures to reduce the specific energy consumption
    - enlisting and planning of energy efficiency measures
    - enlisting of the profitable measures (description, expected investment costs, expected operating costs, expected energy savings and annual financial returns by that energy, estimated IRR).

[7] Information on the Flanders voluntary agreements was obtained from the official EC notification of Belgium (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

- chronological roadmap with timing
- overview of the progress of the specific energy consumption in the last five years (or years for which data are available).

Investments with an IRR after tax of at least 14% ("profitable measures ") should be implemented throughout the duration of the Energy Plan. For measures with an IRR after tax of more than 10% ("potential effective measures ") IRR should be recalculated annually.

- report annually to the Verification Bureau about the energy consumption, implemented profitable measures, studies and potential measures
- work out a number of energy measures and to implement, inter alia format an energy policy statement by the management, appointing an energy coordinator and strengthen the awareness, information and employee involvement.

In exchange for the commitment of the companies, the Flemish Region will not impose additional requirements on energy efficiency or CO_2 reduction (unless imposed by Europe).

2.2.2 Energy saving calculation (methods) and data requirements

To calculate the energy savings resulting from the energy agreements, the same methodology and assumptions can be applied that is used in the Flemish Action Plan 2011 filed under the ESD Directive. Savings resulting from energy agreements may therefore be regarded as the result of a roll-out of European regulations.

Based on the developed audits, the Verification Bureau calculates the energy savings based on the implemented energy saving measures.

2.2.3 Monitoring and verification process

Audits are verified by the Verification Bureau.

2.3 Second generation sector agreements in Wallonia[8]

2.3.1 Short description of the measure

Voluntary agreements between public authorities and the industry aim to improve the energy efficiency of the industrial sector as well as reduce their CO_2 emissions. Commitments of companies are only voluntary but offer several advantages, including

[8] Information on the Wallonian voluntary agreements was obtained from the official EC notification of Belgium (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

- Good knowledge of their energy flows via an energy audit conducted at each of their sites with the financial support of the public authorities
- Long-term visibility with regard to the investments and energy savings program (unfortunately distorted by the vagaries of the current market)
- Regular contact with the administration and political authorities
- An overall improvement in their energy efficiency and thus in their overheads

Concerning the benefits for the public authorities, they are ensured

- A substantial effort from industry to reduce energy consumption and CO2 emissions and
- Better resource and knowledge mobilization, the potential energy savings being the best identified using the companies' internal skills.

In return they have guaranteed participating companies the following different support mechanisms (of course only if companies meet their commitments set in the agreements):

- The use of greenhouse gas emissions reduction targets to calculate CO2 quota allocations for industrial sites affected by the emissions trading mechanisms
- A cap on the refund of green certificates by electricity companies supplying energy-intensive companies, with an obligation on the supplier to refund the gains thus made to his client
- Partial or full exemption (depending on the level of consumption) of energy taxes
- Gradual cap on the federal contribution to electricity

Type of policy measure	Voluntary agreements
Lifetime of the measure	2014 – 2020
Target groups	Industrial sectors, including steel, chemicals, cement, food, paper, metal, etc.
Target technology	All energy efficiency technologies
Target energy savings	9800 GWh cumulative (2014-2020)

Table 7. Main features of the Wallonian 2nd generation sector agreements

2.3.2 Energy saving calculation (methods) and data requirements

The audit report conducted at the start of the period enables the necessary improvements to be determined on the basis of a prioritization of measures and investments advocated by the auditor, in line with the predefined return time criteria.

The method of calculation used to assess the impact of the sector agreements is the same as that used in the PAEE2 for Directive 2006/32/EC. It is based on baseline consumption, along with the consumption and energy efficiency indicators (EII) given in the signatory federations' annual reports. The conversion of primary energy (used in these sector agreements) into final energy is done using a 1.26 coefficient as advised by the Federal Planning Office for the sector. Concerning additionality, the companies undertake to make the investments advocated by the audit, the return time for which is

greater than that of spontaneous investments. The application of the audit's investment recommendations results in directly measurable energy savings in terms of the industries' consumption. It is also this consumption that is monitored.

2.3.3 Monitoring and verification process

The auditors who conduct the initial target-setting baseline audits for each company are accredited by AMURE (Energy Audits and Studies) for sector agreements (Cf. corresponding sheet). Sector plans are validated by technical experts. The management committee steers the sector agreement (Article 7 and Article 9). The company auditor certifies the materiality of the data used in the companies' annual reports. The technical expert, appointed via public tender, is the methodological reference point for each stakeholder.

2.4 Financial incentive in Wallonia: Energy payments AM 22/03/2010[9]

2.4.1 Short description of the measure

The goal of the financial incentive Energy payments is the application of energy-efficient technology or techniques and has the effect of reducing end-use energy consumption. Implementing parties/authorities are the gas distribution network administrator (Art.79) and the electricity distribution network administrator (Art.85).

Type of policy measure	Financial
Lifetime of the measure	2005 - ongoing
Target groups	Industrial sector
Target technology	Various energy saving technologies
Target energy savings	140 GWh cumulative (2014-2020)

Table 8. Main features of the Wallonian subsidy scheme

The following eligible measure categories can be considered:

- Art. 76, para. 1: financial incentive to install any system for recovering heat from smoke in industrial or artisanal ovens, natural gas drying machines or boilers and vapour generators

[9] Information on the Wallonian financial incentive was obtained from the official EC notification of Belgium (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

- Art. 77, para. 1: financial incentive to install a wide modulation system burning natural gas and enabling more effective regulation
- Art. 78, para. 1: financial incentive to install a directly fired or natural gas system for heating products
- Art. 80: financial incentive to install a system for managing electrical lighting systems and facilities
- Art. 81: financial incentive to install a variable speed drive or compressor, pump and ventilation system that makes energy savings of at least 10 %
- Art. 82: financial incentive to install a system for regulating cooling and optimizing de-icing cycles that makes energy savings of at least 20 %
- Art. 83: in the case of building renovation, financial incentive to completely replace the lighting
- Art. 84: in the case of renovation, financial incentive to analyse the electricity consumption of a technical operating unit.

2.4.2 Energy saving calculation (methods) and data requirements

The energy savings due to the investment supported by the renovation incentives are assessed in line with the Bottom-Up methodology advised by the European Commission in the context of the PAEE of Directive 2006/32/EC. Concerning additionality, the renovation works targeted by these payments go beyond those strictly prescribed at Walloon or European level. Double counting with other payments granted by Wallonia for the residential sector is avoided. In terms of materiality, the energy saving are assessed on the basis of technical data (quotes and invoices) directly related to the calculation of payments made.

2.4.3 Monitoring and verification process

As this measure is taken directly the Walloon Government, the administration and Ministry of Energy are responsible for monitoring its impact and proposing possible corrective measures.

Art. 79, 85 and 86 state that a file to be produced for the administration while Art. 87, para. 3 sets a three-year deadline for verifying the application's compliance with the grant conditions and claiming refund of the payment where appropriate. Moreover, Art. 84 states that the content of the electricity consumption analysis needs to be carried out by an accredited auditor.

3 Bulgaria

3.1 Energy Efficiency Obligation (EEO) scheme[10]

3.1.1 Short description of the measure

The purpose of the new Bulgarian White Certificate Scheme will be to drive energy efficiency to realize energy savings by end users. In order to reach their individual targets, the obligated parties may implement energy-saving measures in all end-users sectors. The obligated parties may implement measures that achieve savings in the energy transformation, distribution and transmission sectors, including by means of efficient district heating and cooling systems infrastructure (but not more than 25%). The eligible measures to increase energy efficiency must satisfy the following conditions:

- Their payback time must not be longer than the lifetime of the corresponding measures;
- They must save primary energy resources;
- They must reduce greenhouse gas emissions;
- They must not damage the quality of the environment;
- They must not damage sanitary and hygiene elements.

Type of policy measure	EEO
Lifetime of the measure	2014 – 2020
Target groups	All end-users
Target technology	All energy efficiency technologies
Target energy savings	647.50 ktoe (2014-2020)

Table 9. Main features of the Bulgarian EEO scheme

3.1.2 Energy saving calculation (methods) and data requirements

For the calculation of energy savings, in Bulgaria energy audits or specialized energy-saving assessment methodologies are used. Eleven energy-saving assessment methodologies were adopted

[10] Information on the Bulgarian EEO scheme was obtained from the NEEAP of Bulgaria (https://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_bulgaria.pdf),the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States), the D2.1 report of the ENSPOL project (http://enspol.eu/results) and the Bulgarian Energy Efficiency Act (http://seea.government.bg/documents/ZEE_EN.pdf)

based on a 'bottom up' approach. This enables the energy saved to be determined by measuring and/or calculating energy consumption before and after implementation of the measures. The energy savings are calculated and measured in ktoe or kWh. These methods can be applied to individual measures and groups of measures in order to 'capture' and report the energy-savings effect of each individual measure or program. The total savings achieved by a given measure or program is the sum total of the combined savings achieved by all participants in and/or beneficiaries of the measure or program concerned. 50 more energy-saving assessment methodologies are ready for adoption, of which 19 are for measures in the industry sector.

For the assessment methodologies (according to the template), the minimum required information is:

1. Evaluated measure
   (a) name and type;
   (b) useful technical life;
   (c) the technological and organisational conditions under which it is performed.
2. performed measurements, including
   (a) measurement points and periods, types of measuring instruments;
   (b) measurement methods, techniques and additional equipment;
   (c) measuring procedures to ensure the required accuracy of measurements;
   (d) forms for reporting and documenting the results.
3. expert calculations and evaluations, including:
   (a) necessary conditions and assumptions;
   (b) characteristics of the site; climatic and other external and internal factors.
4. Used standard-reference data conversion factors, and others.

3.1.3 Monitoring and verification process

At least one year after implementation, the savings achieved shall be demonstrated by means of energy efficiency audits that are carried out upon by external auditors; or the application of specific methodologies for assessment of energy savings (under development; bottom-up approach). The energy audits are realised by professionals (for example engineers, architects, etc.) who are certified and registered in the public register. The specific methodologies were developed on the basis of standardised methodologies recommended in EU documents and others that were developed and proposed by those who carry out energy audits of buildings and/or industrial systems, building certifications, conformity assessments of investment projects and energy-saving assessments. The developed specific methodologies should be approved by SEDA (Sustainable Energy Development Agency of Bulgaria) and then adopted by the Minister of Energy. The control on the audits, on the auditors and on the specific methodologies used, as well as the verification of the achieved energy savings is the responsibility of SEDA. The detailed procedure for the development and the approving of the specific methodologies is set in a special Ordinance under the EE Law adopted May 2016 (http://www.seea.government.bg/documents/NAREDBA_ERD043_ot_4052016t.pdf).

3.2 Operational Program 'Development of the Competitiveness of the Bulgarian Economy'[11]

3.2.1 Short description of the measure

The Operational Program 'Development of the competitiveness of the Bulgarian economy 2007–2013' is one of 7 Operational Programs financed by the Structural Funds of the European Union after Bulgarian's accession to the EU. One of the aspects is Indicative operation 2.3 'Implementation of energy- saving technologies and use of renewable energy sources'. The program focuses on all energy efficiency improvement measures that lead to verifiable, measurable or estimable energy efficiency improvement in final energy consumption. Through this measure, grants are provided for investments in green industry, and for energy efficiency and green economy.

The energy saving data for 2015 (reported to SEDA by the Ministry of Economy) are as follows: 5 projects have been finished in the category 'investments in green industry', saving 25.5 GWh, and 167 projects have been finished in 'energy efficiency and green economy', saving 118 GWh, or 65,778 t CO_2eq per year.

Type of policy measure	Financial
Lifetime of the measure	First period: 2007-2013, second period: 2014-2020
Target groups	Industry
Target technology	All energy efficiency technologies
Target energy savings	924 GWh per year

Table 10. Main features of the Bulgarian EEO scheme

3.2.2 Energy saving calculation (methods) and data requirements

Energy savings are calculated based on energy audits both before and after the project implementation.

3.2.3 Monitoring and verification process

Energy audits are conducted by the certified auditors listed in SEDA's public register.

[11] Information on the Bulgarian Operational Program was obtained from the NEEAP of Bulgaria (https://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_bulgaria.pdf) and the document on 'BG14' by the MURE project t(http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/BG14.PDF).

3.3 Mandatory Industrial Audits for Energy Efficiency[12]

3.3.1 Short description of the measure

This scheme is on Mandatory Industrial Audits for Energy Efficiency for enterprises which are not SMEs, industrial systems with annual consumption more than 3000 MWh, and outdoor lighting systems located in towns with population exceeding 20,000 residents. The audits must be conducted at least once every four years or one year after making major changes to the technological equipment or production systems, fuel switching and a change to the energy conversion method. Industrial systems owners with individual energy-saving targets are obliged to implement measures prescribed by the energy-efficiency audit that ensure the achievement of their respective individual energy-saving targets; and industrial systems owners without individual energy-saving targets are obliged to implement measures prescribed by the energy-efficiency audit that ensure the realisation of at least 50 % of the energy-saving potential established by the audit. The same obligated parties are also bound to implement mandatory energy efficiency management.

Type of policy measure	Legislative/informative
Lifetime of the measure	Since 2008, updated 2015
Target groups	Industry, non-SME business
Target technology	All energy efficiency technologies
Target energy savings	839 GWh up to 2016 (individual ES targets only)

Table 11. Main features of the Bulgarian EEO scheme

3.3.2 Energy saving calculation (methods) and data requirements

Annually, not later than the 31st day of January, the owners of enterprises, industrial systems and outdoor lighting systems which are subject to mandatory audit shall submit to the agency a declaration according to a specified template, which is determined through an ordinance by the Minister of Energy and the Minister of Regional Development and Public Works.

Annually, not later than the 1st day of March, the obligated parties shall submit annual reports on energy efficiency management implementation to SEDA. The reports are subject of control and evaluation by SEDA.

[12] Information on the Bulgarian Mandatory Industrial Audits scheme was obtained from the Bulgarian Energy Efficiency Act (http://seea.government.bg/documents/ZEE_EN.pdf), the NEEAP of Bulgaria (https://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_bulgaria.pdf), and the document 'BG1' by MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/BG1.PDF).

3.3.3 Monitoring and verification process

The method for the evaluation is based on assessment of the energy savings after the implementation of energy audits.

3.4 ESCO contracts[13]

3.4.1 Short description of the measure

The Energy performance contracts (ESCO contracts) target at the implementation of energy efficiency improvement measures in buildings, enterprises, industrial systems and outdoor lighting systems.

The objective of the companies that offer ESCO contracts to energy-end users is to implement energy-efficiency activities and measures in buildings and/or industrial systems that will lead to energy savings at the level of final users. The means for repaying the investment and paying the remuneration due to the contractor come from the energy savings achieved. The very mechanism for the execution of contract activities is market-based and encourages competition between ESCO companies. The regulatory basis also stipulates that the investment payback period may not be longer than 10 years.

Type of policy measure	Fiscal, regulatory
Lifetime of the measure	Since 2013 (updated in 2015)
Target groups	Services and industry
Target technology	All energy efficiency technologies
Target energy savings	No quantitative data available

Table 12. Main features of the Bulgarian EEO scheme

3.4.2 Energy saving calculation (methods) and data requirements

Energy efficiency contracts shall be concluded in writing and shall contain at least:

1) the normalised energy consumption established by an energy efficiency audit;
2) a list of the efficiency measures that will be implemented, including the steps to be performed to implement the measures and, where relevant, associated costs;

[13] Information on the Bulgarian ESCO contracts scheme was obtained from the Bulgarian Energy Efficiency Act (http://seea.government.bg/documents/ZEE_EN.pdf) and the NEEAP of Bulgaria (https://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_bulgaria.pdf).

3) the guaranteed energy savings, the procedure and time limits for establishing the said savings after implementing the measures under the contract, as well as provisions on measurement and confirmation of the energy savings achieved, quality checks and guarantees;
4) obligation to fully implement the measures in the contract and documentation of all changes made during the project;
5) display of financial implications of the project and distribution of the share of both parties in the monetary savings achieved;
6) method of financing;
7) method of payment of the remuneration.

3.4.3 Monitoring and verification process

Energy auditors are certified by SEDA and listed in the SEDA's public register.

4 Croatia

4.1 Industrial Energy Efficiency Network (IEEN)[14]

4.1.1 Short description of the measure

The objective of the IEEN is to increase the awareness and knowledge of the employees and the management of industrial companies to enable them to exploit the full potential of energy saving measures. IEEN suggests that energy management structures should be established both at company and industrial levels. Also monitoring and analysis of energy consumption needs to be established and targets to be set. On this basis, a comprehensive database will be developed and used as benchmarking against companies both in Croatia and the EU. Key industrial sectors need to draw up activities plans under the measures while the implementation of measures are planned to be co-financed by EPEEF (Environmental Protection and Energy Efficiency Fund) and potentially by using EU funds.

In summary, the key elements of IEEN are: establishing permanent structures for SEM ('Systematic energy management in cities and counties'), supervision and analysis of energy consumption, setting objectives; energy audits; demo projects (implementing best practice projects and disseminating information on such projects); education and training.

The Network's work program is expected to be fully developed by EPEEF by 2016 and include the key industrial entities, proposal of energy saving measures, the implementation plan and the required amount of funds. Implementation of the program is the responsibility of HGK (Croatian Chamber of Economy) in cooperation with ME (Ministry of Economy) and CEI (Centre for Monitoring Business Activities in the Energy Sector and Investments).

Type of policy measure	Voluntary agreements and cooperation
Lifetime of the measure	2008 - 2020
Target groups	Industrial plants
Target technology	All energy efficiency technologies
Target energy savings	Not estimated yet but could be very significant

Table 13. Main features of the Industrial Energy Efficiency Network

[14] Information on the IEEN was obtained from the NEEAP of Croatia (https://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_croatia.pdf) and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States)

4.1.2 Energy saving calculation (methods) and data requirements

Energy saving calculation will be based on industrial consumption data but the methodology for calculation still needs to be developed. In the industrial sector there are only few prescribed methods, mainly for energy efficiency electric motor drivers, building measures (relating to industry), lighting, and heating systems.

Croatia has established an IT-tool called SMIV (http://smiv.cei.hr) to introduce a monitoring and verification scheme. The energy savings, data from successful projects and algorithms are listed at the platform of this tool where the data can be inserted in three ways:

a) using reference data, calculations carried out with automated formulas and methodology
b) from energy audits and project design documents, and
c) through exact metering of energy savings, where specific data can be directly inserted.

Each data insertion refers to a specific measure implementation, while for the industry there are only few measures thus far. The obliged parties that are responsible to fill in the data are

a) subsidy providers (such as the Energy Efficiency Fund, EBRD and others),
b) ESCO companies, and
c) Public sector.

Data for monitoring and implementing energy efficiency measures are obtained by paid subsidies. The plan is that all data from ongoing project will be uploaded to SMIV constituting bottom-up collected data.

4.1.3 Monitoring and verification process

ME and CEI are the responsible bodies for monitoring this program. The verification of the measured energy savings is performed by using specific algorithms in the SMIV. A methodology still needs to be established for future activities (the BU method can be established for every standardized measure, or a savings evaluation can be required). CEI will be responsible to develop the methodology based on the program and it will monitor the effects through the Energy Savings Measuring and Verification System. One possible basis for the methodology could be the BU (bottom-up) method that determines estimates directly from the implemented measure. This method could be established for all standardized measures or, as an alternative, a savings evaluation could be conducted.

4.2 Energy audits of small and medium enterprises[15]

4.2.1 Short description of the measure

The main goal of this measure is to provide financial support to small and medium enterprises (SMEs) to facilitate the implementation of energy saving measures and conduct high-quality energy audits and efficient energy management. Also the promotion of energy efficiency and education of employees on this topic is an essential part of the measure. As a result, there were two types of support schemes planned:

1. Financial support: at least once per year, EPEEF will launch a call for tender for SME building owners to finance their energy audits
2. Education support: an information method was expected to be developed by MA by 2014. MA also responsible to specify the criteria the education needs to satisfy. In any case, educational activities (provided by EPEEF) must include the topics of the introduction of an energy management system, energy audit and energy efficiency improvement projects.

Type of policy measure	Financial, information
Lifetime of the measure	2014 - 2016
Target groups	SMEs
Target technology	All energy efficiency technologies
Target energy savings	Cannot be estimated yet (only after 2016)

Table 14. Main features of the energy audits

4.2.2 Energy saving calculation (methods) and data requirements

In regard to available data, the principle of 'measured' savings is used on the basis of the difference in energy consumption before and after the implementation of the energy efficiency measure. This measure will be monitored using the ex-ante method. The life cycle will be defined with the new MRV rules, and it will be possible to calculate the specific expected savings once the Rules are adopted.

Energy savings resulting from the energy audit itself are determined on the basis of evaluated potentials given in the final report of the energy audit. It is assumed that at least 5 % of those potentials will be achieved. Certain European recommendations contain significantly higher assumptions (20% for electricity and 15% for other forms of energy), but they will not be used because they take into account only the effect of raised awareness of users which would result in

[15] Information on the energy audits was obtained from the the NEEAP and the official EC notification (https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_croatia.pdf) of Croatia.

better maintenance and management procedures ('soft measures') by means of which energy savings are achieved

The energy audit and the energy certification of a building are conducted by a person who is authorised by the Ministry of Construction and Physical Planning pursuant to the Rules on the conditions and criteria for persons conducting energy audits.

4.2.3 Monitoring and verification process

Monitoring is the responsibility of HGK and MA in cooperation with CEI. The impacts of this measure are monitored by using the national Method of reference values and the BU method recommended by the European Commission.

4.3 Program of energy renovation of commercial non-residential buildings[16]

4.3.1 Short description of the measure

This measure focuses on the renovation of existing building built before 1987 with the aim to comply with low-energy standards and achieve energy classes of B, A or A+. Funding of about HRK 1 784 360 000.00 by 2016 is available from multiple sources including HBOR (Croatian Bank for Reconstruction and Development), and commercial banks, EPEEF, HAMAG BICRO (Croatian Agency for SMEs, Innovations and Investments), EIB (European Investment Bank), EBRD (European Bank for Reconstruction and Development), CroPSSF (Croatian Private Sector Support Facility) and WeBSEFF II (Western Balkan Sustainable Energy Financing Facility). Possible additional financial sources might be EU Structural Instruments, ELENA revolving funds, Horizon 2020, JASPERS (Joint Assistance to Support Projects in European Regions) and EEE-F (European Energy Efficiency Fund).

Type of policy measure	Financial
Lifetime of the measure	2014 - 2020
Target groups	Existing non-residential buildings, including Industrial facilities (halls, industrial plants, storage facilities, warehouses and other similar facilities which are predominantly privately owned)
Target technology	Typical projects are replacement of primary heating fuel (fuel oil and diesel were replaced with natural gas or

[16] Information on the energy renovation program was obtained from the NEEAP and the official EC notification of Croatia.

Type of policy measure	Financial
	liquefied petrol gas), heat recovery systems, improvement of central heating system efficiency, lighting system reconstruction and alike.
Target energy savings	985 TJ in 2016 and 2298 TJ in 2020

Table 15. Main features of the energy renovation program

4.3.2 Energy saving calculation (methods) and data requirements

Input data must be determined for each individual building (project design) and reference values should be used only in special cases.

4.3.3 Monitoring and verification process

Monitoring, using recommended European Commission BU methods, is the responsibility of MCPP, MT, MENP and ME. The life cycle of the savings of the measures is 25 years.

5 Cyprus

5.1 Co-financing for energy audits in industry[17]

5.1.1 Short description of the policy measure

The measure concerns co-financing for conducting energy audits in industry and implementing the energy efficiency investments proposed in the energy audit report. The measure will concern approximately 10 industries per year. Co-financing (instead of grants) may take the form of tax incentives or low interest loans to beneficiaries. The percentage of the investment not financed will be paid by the beneficiary. The total amount of investment per year is € 1.5 million.

Type of policy measure	Financial
Lifetime of the measure	2014-2020
Target groups	Industry
Target technology	The measure focuses on approximately 10 industries per year (not specified)
Target energy savings	15,400 toe in 2020 (cumulative)

Table 16. Main features of the Cypriot co-financing instrument for energy audits

5.1.2 Energy saving calculation (methods) and data requirements

The methodology used for calculating energy savings from implementing the measure is the 'ex ante' methodology 'a' (deemed savings) under Paragraph 1 of Annex V. It is noted that methodology 'c' (scaled savings) described in Annex V will be used while implementing the measure for each building separately, based on calculations for the period 2004-2012, when the financing schemes for industry were finalised.

5.1.3 Monitoring and verification process

Monitoring and verification will be performed by the Energy Service of the MECIT (Ministry of Energy, Commerce, Industry and Tourism). The MECIT will inspect the projects implemented at least once a year.

[17] Information on the co-financing scheme was obtained from the official EC notification of Cyprus (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures).

5.2 Governmental grants/subsidies scheme[18]

5.2.1 Short description of the policy measure

The governmental grants/subsidies schemes for the promotion and development of renewables and energy efficiency have been operating since 2004 under the management of the Special Fund for RES and Energy Efficiency and intend to provide financial incentives in the form of government grants and/or subsidies for implementing investments and encouraging the use of renewable energy sources. Grants schemes aim to: promoting energy efficiency and RES in the housing, tertiary, industrial and agricultural sector, raise citizen's awareness of RES issues and contributing to RES targets and energy savings targets.

The instrument entails that industries carry out energy savings actions and the external auditors formulate a detailed study on the situation before/after and calculate energy savings. This study is being presented to the Ministry, and based on the Ministry's evaluation the industry can receive a subsidy for the technology implemented.

Type of policy measure	Financial, information/education/training
Lifetime of the measure	Since 2004
Target groups	Housing, tertiary, industrial and agricultural sector
Target technology	Several technologies including photovoltaic, solar space heating, and central active solar water heating
Target energy savings	Cumulative targets for 2014-2020: 187.8 TOE for photovoltaic systems 249 TOE for solar space heating/cooling (tertiary sector) 1045 TOE for central active solar water heating systems (tertiary sector)

Table 17. Main features of the Cypriot grants/subsidies scheme

[18] Information on the governmental grants scheme was obtained from the official EC notification of Cyprus (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), multEE deliverable D1.2: Synthesis report on M&V schemes and coordination mechanisms in EU Member States (http://multee.eu/system/files/D.1.2_Mapping%20Synthesis%20report.pdf), and the website of MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/CY3.PDF).

5.2.2 Energy saving calculation (methods) and data requirements

The main data sources, which are utilised for the monitoring implemented energy efficiency measures in different sectors, include the obtained data from the official statistics office, national databases and programs, which have undertaken the financing of the implemented energy efficiency measures.

The Ministry of Energy, Commerce, Industry and Tourism is responsible for the establishment of the data collection process and the development of the appropriate methodology for the estimation of the achieved energy savings including the utilised indicators.

The measurement of the implemented energy efficiency measures is performed through the establishment of bottom-up methodologies for each energy efficiency measure separately.

Specifically, for the majority of the measures the calculation will be performed through the implementation of the scaled method and the adoption of the necessary engineering estimates of the achieved energy savings according to the requirements of Annex V of the EED. Moreover, in some energy efficiency measures the deemed savings method is preferred for the calculation of the achieved energy savings, while in limited cases the metered savings method is utilised. The climate variability is taken into consideration during the calculation methods, when this is required, while the specification of the lifetime of each measure is performed according to the requirements of the EED.

There is no annual report from each company to the Ministry, but only when a file is being submitted for subsidy. For some measures there are standardized methodologies (mainly for buildings), while for most types of measures auditors can select and present their own methodologies for calculating energy savings.

5.2.3 Monitoring and verification process

The monitoring is carried out internal within the Ministry (with sampling checks), while there is an agreement between the partners for the continuation of the use of the energy saving measure for 5 years. These studies are kept within the ministry and there is a database for energy savings from subsidized technologies. The reporting period of the M&V scheme has been established on annual basis.

6 Czech Republic

6.1 Operational Program Enterprise and Innovation for Competitiveness[19]

6.1.1 Short description of the policy measure

The Operational Program Enterprise and Innovation for Competitiveness (OP PIK) is a basic program document of the Ministry of Industry and Trade for the disbursement of funds (overall amount of 4,316 million Euros) from the European Regional Development. The program aims to achieve a competitive and sustainable knowledge and innovation-based economy. The programs targets the Czech industrial and service sector as well as other business entities (small, medium-sized and, where appropriate, large enterprises); for intervention in the field of energy savings (the insulation of production and business structures), also agricultural holdings, food businesses, undertakings providing accommodation and catering services, and retail organisations.)

Type of policy measure	Financial engineering instruments/Investment grants
Lifetime of the measure	2014-2020
Target groups	Industry, services
Target technology	Various energy saving technologies (see below)
Target energy savings	6.857 PJ (2014-2016) 9.143 PJ (2016-2020)

Table 18. Main features of the Czech Operational Program Enterprise and Innovation for Competitiveness

Supported activities are

- the modernisation or replacement of existing energy production facilities for internal purposes, which will increase their efficiency;
- the introduction and upgrading of measurement and control systems;

[19] Information on the Czech Operational Program Enterprise and Innovation for Competitiveness was obtained from the official EC notification of Czech Republic (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), the website of MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/CZ13.PDF) and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

- modernisation, reconstruction and loss reduction in electricity and heat distribution systems in buildings and production plants;
- the implementation of measures to improve the energy performance of buildings in the business sector (building envelope insulation, the replacement and renovation of windows and doors, other structural measures having a demonstrable influence on the energy performance of buildings, the installation of ventilation technology with waste heat recuperation);
- re-use of waste energy in production processes;
- improvements in energy performance and energy efficiency in production and technological processes;
- the installation of renewable energy sources for an undertaking's own consumption;
- the installation of a cogeneration unit with maximum use of electricity and thermal energy for the undertaking's internal consumption, the support of extra costs in achieving the standard of a nearly zero-energy building and a passive energy standard in the reconstruction or construction of new business buildings. Extra costs will be derived from model examples and, for the purposes of support, will be set as a fixed amount for a clearly measurable quantity (e.g. per square meter of energy related area);
- efficiency improvement of heat supply systems.

6.1.2 Energy saving calculation (methods) and data requirements

The establishment of the data collection and measurement procedures will be performed in relation with the potential savings of each sector and their cost-effectiveness. The proposed four options from the EED will be implemented (deemed savings, metered savings, scaled savings, surveyed savings). Specifically, deemed savings are reported in an on-line questionnaire and documented by invoices for the technology purchased, labour, energy in previous periods, etc. Metered savings will always be calculated ex-post by a qualified energy auditor. Moreover, scaled savings will be used only in cases where establishing robust measured data for specific installation is difficult. Finally, surveyed savings will be applied to non-investment support targeted at information campaigns.

6.1.3 Monitoring and verification process

Energy assessments are enshrined in the Czech national law. A model energy assessment and the scope thereof can be found in Implementing Decree No 480/2012 on energy audits and assessments, which implements Act No 406/2000 on energy management.

Czech Republic has not an existing M&V scheme for energy efficiency yet. The Directive 2012/27/EU (EED) is still being transposed into the national legislation. As a result, no experience regarding the administration, effective use and evaluation of the M&V mechanisms exists. Their use will depend on the successful implementation of pilot projects, while their development is on progress complying with the requirements of the corresponding EU legislation. Verification process will be performed by implementing public authorities checking the correctness of the specified and measured data. The reporting of the implemented energy efficiency measures is required on annual basis.

6.2 EFEKT Program[20]

6.2.1 Short description of the policy measure

The EFEKT Program is a State program that aims to promote energy savings and utilisation of renewable energy sources in the industry and service sectors.

Type of policy measure	Investment and non-investment grants
Lifetime of the measure	2007 - ongoing
Target groups	Industry, services
Target technology	Not specified
Target energy savings	Savings target for the whole industrial sector is 21 PJ (not specified for this program).

Table 19. Main features of the Czech EFEKT Program

6.2.2 Energy saving calculation (methods) and data requirements

The main methods used are Deemed and surveyed savings. They are similar to the methodology reported for the measure OP PIK above.

6.2.3 Monitoring and verification process

Similar to the methodology reported for the measure OP PIK above.

[20] Information on the Czech Operational Program Enterprise and Innovation for Competitiveness was obtained from the official EC notification of Czech Republic (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

7 Denmark

7.1 Energy Efficiency Obligation (EEO)[21]

7.1.1 Short description of the policy measure

The Danish EEO has already been implemented in 2006 and will remain in force up to 2020. The main objective is to promote cost-effective energy savings for the benefit of consumers, enterprises and society. This measure is applicable to all electricity grid operators, natural gas distributors and district heating companies under the Electricity Supply, Natural Gas Supply and heating Supply Acts. There is therefore a legal basis to impose energy efficiency obligations on a yearly basis, however in practice energy efficiency targets are determined based on voluntary agreements between the Minister for Climate, Energy and Building and the obligated parties. The latest agreement called "The Energy Savings Agreement" signed in 2012 runs from 2012 to 2020 and is renegotiated in every three years. The agreement only contains the energy efficiency targets for individual branches and not for individual companies; therefore it is the branches` task to allocate saving targets to individual companies.

Savings are credited by using a weighting factor, reflecting the lifespan of the savings, impact on primary energy consumption associated with the implemented saving, as well as the expected CO_2 impact of the savings and considering whether a saving occurs inside or outside the ETS area.

Type of policy measure	Obligation
Lifetime of the measure	Since 2006
Target groups	Electricity grid operators, natural gas distributors, district heating companies and oil companies
Target technology	Free choice of saving measures (with few exceptions defined in the agreement)
Target energy savings	Accumulated savings target of 172.93 PJ for the period of 2014-2020

Table 20. Main features of the Danish EEO scheme

[21] Information on the energy taxes was obtained from the official EC notification of Denmark (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results)

7.1.2 Energy saving calculation (methods) and data requirements

Savings are determined either using deemed savings (standard values) or according to the effect of a specific market impact (surveyed savings). In case there are no standard values available, specific calculations are used. These will typically be larger and integrated projects in industrial enterprises or public institutions. If a specific calculation is used for parts of an overall project, then the entire project must be calculated specifically, including the effect of initiatives where standard values exist. The calculation may include a documentable effect of a specific market impact that entails a reduction in energy consumption relative to a baseline. As far as possible, the effect must be calculated using standard values.

Calculations of the energy consumption before and after implementation of the energy savings and thus, the effect of the initiative, must be therefore be based on specific measurements, savings on the main meter, invoices from energy companies, and/or technical calculations. Calculation of the energy consumption after implementation of the initiative is most often done ex-ante to be able to calculate subsidies prior to the consumers' investment decision.

A specific calculation must be completed for a representative and comparable production period. The grid and distribution company must be able to document all calculations, measurements and other matters pertaining to the calculation of the specific energy saving, including:

- a calculation of energy consumption before implementation of the initiative – *the reference,*
- a calculation of energy consumption after implementation of the initiative,
- a calculation of the effect of the initiative, expressed as the total energy saving in the first service year after implementation of the initiative. Adjustments will have to be made for any changes to service times, production volume and production mix, and others,
- assumptions (service times, changes to production, effects of labelling and others),
- the project's simple payback time, expressed as the relationship between the investment (less subsidy) and the value of the first year's energy savings. Investment and energy prices must be documented upon request in the form of quotes/invoices. Costs for which there is no documentation may account for no more than 10% of the total investment. The end user's decision-making basis for implementing the specific project may serve as documentation,
- the energy type and
- prioritization/conversion factor.

In connection with a specific calculation, energy labelling of buildings can only be applied as the basis in case the calculation of the effect meets the requirements under this agreement. The level of detail on the specific calculation must be adapted to the specific project. The larger the project, the greater the requirements are for the calculation. As described above, there is no general requirement for measurement of consumption before and after.

7.1.3 Monitoring and verification process

Energy savings cannot be reported until they have been realized and documentation has been finalized. The grid and distribution company must document the realization of the energy savings, including the date of the realization. This documentation could consist e.g. of a confirmation from the end user that the energy savings have been realized, or a copy of the invoice for work completed.

Directly or indirectly e.g. through reference to player agreements etc., documentation of the individual saving must include information about the companies' costs of acquiring the right to report the energy savings.

DSOs are responsible for ensuring that their documentation of energy savings is correct, fulfilling all the requirements. As part of their quality assurance, obligated companies must each year carry out an audit (developed by an external auditor) to ensure and demonstrate that the notified savings have been realized and documented in accordance with the agreement. Documentation of savings does not need to be submitted to the Danish Energy Agency (DEA), but must be kept by obligated parties for 5 years for random checks that are supervised by the DEA (including on-site inspections as well as surveys of intermediaries and final consumers). The overall administration costs of the scheme are about 540 k€/a.

The documentation must include identification of all players involved, including the end-user at which the saving was implemented. The end user must be clearly identifiable via name/company name, address of the place of implementation, and, if required for unique identification, also business registration number or building and dwelling registration number.
The documentation must also include information about the grid and distribution company's type of involvement in the specific initiative (subsidy, advice or other). The grid and distribution company must be able to document that the realization of savings was not commenced prior to the company's involvement. This documentation may consist of a dated agreement between a grid and distribution company and the end user on transfer of the energy savings, or another agreement, invoice, or similar, which states the date of commencement of the realization, and which can be compared with the date of the company's involvement. Entering a binding agreement to purchase equipment etc. or a binding agreement to launch a project is considered commencement of the realization.

8 Estonia

8.1 Energy Efficiency Obligation (EEO)[22]

8.1.1 Short description of the policy measure

Estonia's original plans to achieve the energy savings targets set in the EED were to be attained through the implementation of alternative measures. However, this approach has changed with the submission of their main Energy Act whose reading in the Parliament is supposed to start at the beginning of 2016. The Act envisages the possibility of EEOs implementation. The EEO scheme of Estonia is therefore only tentative, but it would target all end-use sectors, energy transformation, distribution and transmission.

The scheme might include Investments and investment support for energy savings in all end user sectors, and energy transformation, distribution and transmission sectors; contributions to the Energy Efficiency National Fund, information activities, introduction of standards, norms and labelling schemes. The only source of financing the Energy Efficiency Fund is the contributions of the companies that do not take their own measures to meet the energy efficiency obligation. Contributions to the Energy Efficiency Fund should be determined on the basis of the nature of potential energy saving measures (scope, implementation costs, and possible distribution of costs between parties in the implementation of activities) and the manner of financing of the measures.

Obligated parties are energy distributors or retail energy sales companies (obligated parties) in gas, electricity and district heating sectors, whose annual amount of energy supplied or sold exceeds 100 GWh per year.

Type of policy measure	Obligation
Lifetime of the measure	✓ Most probably till 2020 (start date is not known yet)
✓ Target groups	✓ Energy distributor and retail companies
✓ Target technology	✓ Not specified yet
✓ Target energy savings	✓ 1200 GWh (for the entire obligation period)

Table 21. Main features of the Estonian EEO

[22] Information on the energy taxes was obtained from the official EC notification of Estonia (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results)

8.1.2 Energy saving calculation (methods) and data requirements

The calculations of energy savings are based on the draft methodology for determining the energy efficiency indicators referred to in the Directive 2006/32/EC of the European Parliament and of the Council, which consists of three main documents: Recommendation note – Harmonized top-down calculation model, Harmonized bottom-up calculation model and Preliminary list of harmonized average lifetimes of energy efficiency improvement measures and programs for bottom-up calculations. The draft methodology describes top-down and bottom-up indicators in detail and contains the necessary explanations and formulas. These formulas serve as the basis for calculating energy savings and progress towards compliance with the national energy efficiency obligation.

The top-down and bottom-up indicators are described in more detail in Annex 3 of the document `*Analysis of the options for implementing Energy Efficiency Directive 2012/27/EU*` which sets out all the top-down and bottom-up indicators for different sectors.[23]

The above-mentioned indicators are the basis for calculating energy savings; however, the formulas need to be adapted so that the energy savings from the measures to be taken can be calculated both for different sectors where energy is consumed and for different forms of energy. Therefore, the top-down and bottom-up indicators need to be combined and modified to cover all the sectors and forms of energy.

8.1.3 Monitoring and verification process

The main data sources for monitoring the implemented energy efficiency measures in different sectors consist of the Statistics office (*Statistics Estonia*), as well as other national databases, data from paid subsidies and the submitted reports by the obligated parties.

It is proposed the supervision of the obliged energy utilities should be undertaken by the Competition Authority, as the energy market regulator. The Competition Authority compiles national consolidated data on the EEOS in Estonia and submits them to the MEAC. Moreover, it advises the obligated companies on the preparation of reports and contributes to the improvement of the evaluation of the triggered impacts.

The MEAC develops the impact evaluation methodologies, advices the authorities engaged in the implementation of the alternative policy measures regarding the development and improvement of impact evaluation methodologies and provides to the Statistics Estonia the necessary data.

Monitoring and verification protocols of the authorities will be guided by the Administrative Procedure Act.[24] To ensure independence, the criteria laid down in Section 10 of the Administrative Procedure Act will be applied.

Audit protocols will include at least the following:

[23] https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_estonia_annexa.pdf

[24] https://www.riigiteataja.ee/akt/123022011008

- information on the person/authority conducting the audit and on the obligated party;

- information on the audited measure;

- information on sampling and on the audited activities carried out under the measure in question;

- assessment of the effectiveness of the audited measure;

- report (conclusion) of the person/authority conducting the audit.

The requirement in the second subparagraph of Article 7(1) will be taken into account when deciding on the implementation of an energy efficiency obligation scheme and evaluating the results of its implementation. The results of implementation of the energy efficiency obligation scheme will be evaluated separately for each year in which the scheme was implemented.

8.2 Financing schemes[25]

8.2.1 Short description of the policy measure

The most important financing measures are being planned under the Energy efficiency priority axis (measures 1-3) and the Growth-capable entrepreneurship and the RD&I supporting it (measure 4):

1. Energy efficiency in housing.
2. Efficient generation and transmission of heat.
3. Improving energy efficiency.
4. Increasing the share of renewable energy and increasing the energy and resource efficiency of companies.

The obligation period is between 2014 and 2020 with two intermediate periods; the first between 2014 and 2016 and the second between 2016 and 2018. Eligible measure categories are Investments and investment support for energy savings in all end-use sectors, and energy transformation, distribution and transmission sectors as well as financing instruments.

Implementing public authorities are KredEx Credit, Export Guarantee Fund and the Environmental Investment Centre.

Type of policy measure	Financial
Lifetime of the measure	✓ 2014-2020
✓ Target groups	✓ Apartment buildings, street lighting and industry

[25] Information on the energy taxes was obtained from the official EC notification of Estonia (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

Type of policy measure	Financial
✓ Target technology	✓ Not specified
✓ Target energy savings	✓ 1721 GWh (over the entire obligation period)

Table 22. Main features of the Estonian Financial schemes

8.2.2 Energy saving calculation (methods) and data requirements

Data on the implementation of specific measures will be collected by various state authorities, the state's foundations and companies (e.g. KredEx and EIC). In order to simplify the preparation of consolidated reports, the Ministry of Economic Affairs and Communications (MoEAC), the entity in charge of gathering the data, should establish basic units and forms for the annual submission of data.

The calculation methodology is similar to that of reported for the planned EEO scheme. In addition, methodologies and benchmarks for engineering estimates: the methods and benchmarks to be used are based on the best available studies and methods used therein, for example, 'Improving the energy efficiency of the building stock – energy savings, unit costs and volumes'.[26]

8.2.3 Monitoring and verification process

No additional monitoring of implementing public authorities will be arranged, because these authorities will be audited within the EU cohesion policy implementation framework.

The requirement in the second subparagraph of Article 7(1) (implementation of measures with specific results during the obligation period) will be taken into account when planning financing schemes and evaluating the impact of financing schemes achieved in intermediate periods.

8.3 Energy and CO_2 taxes[27]

8.3.1 Short description of the policy measure

Energy and CO2 taxes target all end-use sectors, and energy transformation, distribution and transmission sectors. The segment of taxpayers is defined in the Alcohol, Tobacco, Fuel and

[26] http://www.energiatalgud.ee/img_auth.php/c/c1/ENMAK-Hoonete-uuring-20.09.2013.pdf

[27] Information on the energy taxes was obtained from the official EC notification of Estonia (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

Electricity Excise Duty Act.[28] This measure has the same two intermediate implementing periods as was described for the financial schemes above. The implementing public authority for this measure is the Tax and Customs Board.

Type of policy measure	Taxes
Lifetime of the measure	✓ 2014-2020
✓ Target groups	✓ All end-use sectors, energy transformation, distribution, and transmission
✓ Target technology	✓ Not specified (excise duty and VAT on fossil fuels)
✓ Target energy savings	✓ 4758 GWh (over the entire obligation period)

Table 23. Main features of the Estonian Energy and CO_2 taxes

8.3.2 Energy saving calculation (methods) and data requirements

The method for calculating tax effects, and the price elasticity used are described in subsection 3.1.1 of the study `*Analysis of the options for implementing Energy Efficiency Directive 2012/27/EU*`.

Specific approach will be developed for the quantification of the achieved energy savings from the adopted tax measures. The estimation of the energy savings is based on assumptions about the price of energy, the final consumption quantities, the tax rates and the temporal constancy of the price elasticity coefficient. The energy savings to be achieved as a result of tax effects are not regarded as cumulative savings, as the lifetime of tax measure is considered equal to one year.

8.3.3 Monitoring and verification process

The monitoring and verification is still in the development phase in Estonia. The monitoring requirements are laid down in the Directive will be applied when drafting the legislation transposing the Directive.

[28] https://www.riigiteataja.ee/akt/105112013009

9 Finland

9.1 Energy efficiency agreement activities[29]

9.1.1 Short description of the policy measure

The Energy Efficiency Agreements 2008–2016 and the preceding Energy Savings Agreements (1997–2007) have played a crucial role in the implementation of Finland's every climate and energy strategy. The Energy Efficiency Agreement for Trade and Industry contains an action plan for energy-intensive industries, five sector-specific action plans for medium-sized industries (food, chemical, plastics, wood processing, and technology) and a general industry action plan for companies that do not have a separate action plan for their own sector. The total energy consumption by the industrial companies which have joined the agreement activities covers approximately 85 % of overall industrial energy consumption.

The target groups, including industrial companies, commit to the targets for implementing their own agreement/action plan, set an energy savings target for themselves, and report annually on the implemented measures and their savings impact. The Confederation of Finnish Industries promotes the achievement of the coverage target and the implementation of the agreement/action plan in the industry sector.

Type of policy measure	Voluntary agreements
Lifetime of the measure	Since 1997, renewed in 2008
Target groups	Industrial companies, private service sector companies, municipalities and joint municipal authorities, industrial facility owners and rental housing associations
Target technology	-
Target energy savings	20,046 GWh in 2014-2016 (cumulative), and 10,064 GWh in 2017-2020 (cumulative).

Table 24. Main features of the Finnish energy efficiency agreement activities

[29] Information on the Finnish energy efficiency agreement activities was obtained from the official EC notification of Finland (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), and the MURE database (www.measures-odyssee-mure.eu/public/mure_pdf/industry/FIN14.PDF).

9.1.2 Energy saving calculation (methods) and data requirements

The main method employed is Bottom-up calculation, which was used in the NEEAP-2 calculation and has since been modified to conform to the Energy Efficiency Directive.

The calculation takes into account the lifetime of savings separately for operational and technical measures. The calculation also takes into account the need arising from eco-design requirements to calculate the savings resulting from measures only to the extent that they exceed the minimum level set out for the technology.

Each participating company and organisation reports data, including the following, on a yearly basis:

- general information (contact information, sector etc.)
- detailed energy use data
- energy saving measures taken (other than those reported in energy audits), including year of implementation, investment required, pay-back period, etc., estimated energy savings (electricity, heat, fuels) MWh/a
- information on the implementation rate of energy saving measures in process industry as proposed in energy audits
- information on energy efficiency management systems, including information on monitoring of consumption, energy efficiency plans and environmental management system
- other issues relating to use of renewable energy, consideration of energy efficiency in planning and procurement, staff training on energy issues, communications on energy savings and efficiency, energy efficiency in transport and logistics, etc.

9.1.3 Monitoring and verification process

The results of the energy efficiency agreements are monitored through annual reporting by participating companies and organisations. Once the reporting is completed, the order of magnitude of data provided and its general accuracy is reviewed by Motiva and further information is requested from the companies as necessary.

9.2 Energy auditing programme (EAP) in industry and energy sectors[30]

9.2.1 Short description of the policy measure

Energy audit activities have long played a crucial role in Finland's energy policy. Energy audits were set out as an obligation in the Energy Conservation Agreements (1997–2007) and they are also a measure for implementing the Energy Efficiency Agreement for Trade and Industry in 2008–2016.

Under the programme, various energy audit models have been developed for different user groups and for different needs. Energy audits always include an assessment of current energy and water consumption, proposals for energy saving measures and their estimated savings impact as well as reporting. Energy audits are carried out by authorised energy auditors trained by Motiva.

Three energy audit models are available for industry: industry energy audit, industry energy analysis and a two-stage process industry energy analysis. Industrial companies can also use energy audit models developed for the service sector for its regular facilities, such as office buildings.

Type of policy measure	Financial, information/education/training
Lifetime of the measure	The energy auditing program has been operational since 1994
Target groups	Industry, buildings
Target technology	n/a
Target energy savings	1,784 GWh in 2014-2016 (cumulative), and 925 GWh in 2017-2020 (cumulative)

Table 25. Main features of the Finnish EAP scheme

9.2.2 Energy saving calculation (methods) and data requirements

The main method employed is the Bottom-up calculation, which was used in the NEEAP-2 calculation and has since been modified to conform to the Energy Efficiency Directive.

The calculation takes into account the lifetime of savings separately for operational and technical measures. The calculation also takes into account the need arising from eco-design requirements to

[30] Information on the Finnish energy auditing programme in industry was obtained from the official EC notification of Finland (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the MURE database http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/FIN3.PDF

calculate the savings resulting from measures only to the extent that they exceed the minimum level set out for the technology.

- The baseline data for calculations are retrieved from the energy audit and energy efficiency agreement monitoring system, into which information on the facility is gathered in three stages.
- From the application and subsidy decision, at least the following: volume, year of construction, building type, participation in the conservation activities, audit subsidy allocated.
- From the energy audit report:
    - energy and water consumption data from the year preceding the audit
    - for each proposed measure, at least the following: brief description of the measure or its name, measure classification that allows separation of operational and technical measures; heat, electricity and/or water savings in terms of energy units (kWh/a) and costs (€/a); investment estimate and the direct pay-back period of the measure (€, a); implementation rate of proposed measures (realised = T, decided = P, considered = H, not to be realised = E)
- From annual reporting related to energy efficiency agreements:
    - information on the realisation of measures proposed in the energy audits, used for updating the implementation rate of saving measures proposed in the audits (T, P, H, E)
    - whether the facility participates in emissions trading.

Each measure proposed in the energy audit is assigned a status in the energy efficiency agreements' annual reporting based on whether the measure is realised (T), due to be implemented (P), being considered (H) or whether a it has been decided to not implement (E) the measure. The implementation rate (IR) of the saving measures proposed in energy audits is taken into account in this calculation, calculated as an implementation percentage (I) which only contains realised savings, only based on measures proposed in energy audits and reported as actually implemented by participants to the energy efficiency agreements in their annual reports. IR

9.2.3 Monitoring and verification process

The energy audit volumes (including number of buildings and their cubic volume in the service sector; industrial energy use covered by energy audits), and results (saving potential) subsidised by the Ministry of Employment and the Economy are monitored on a yearly basis.

The implementation of measures proposed in the energy audits is monitored through annual reporting under the energy efficiency agreements. The actual energy conservation results can be estimated using the saving potentials identified in the energy audit reports and by the status of implementation reported by the client.

The responsible ministry (Ministry of Employment and the Economy) monitors the effectiveness of energy audit activities and takes corrective measures as required.

10 France

10.1 Energy Saving Certificate Scheme (ESC)[31]

10.1.1 Short description of the policy measure

Public authorities have imposed an obligation on energy suppliers (electricity, gas, heat, cold, domestic fuel oil and fuel for motor vehicles) in order to save energy and promote energy efficiency. The obligation concerns all sectors except facilities subject to ETS and it requires them to hold energy efficiency certificates and actively promote energy efficiency to their customers. Currently, 109 standardized operations are currently eligible (more to be updated) (94% of CEE issued so far). Other actions can be assessed according to an official methodology (mostly for large actions in industry, 6% of the CEE).

Depending on the sales volumes, operators shared a three-year objective, after which they have to prove that they have met their obligations by having a certain amount of certificates (1 energy efficiency certificate = 1 kWh_{cumac}[32] of final energy). Certificates can be obtained by implementing energy saving measures or by purchasing from other operators that have taken actions to save energy. In case of non-compliance, operators must pay a penalty of EUR 0.02 per kWh_{cumac} of shortfall.

Type of policy measure	Obligation
Lifetime of the measure	✓ 2005 - ongoing
✓ Target groups	✓ Energy suppliers
✓ Target technology	✓ Hard investments in energy-efficient equipment or materials
✓ Target energy savings	✓ 314 TWh (2014 – 2020)

Table 26. Main features of the French Energy Saving Certificate Scheme

[31] Information on the ESCs was obtained from the official EC notification of France (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

[32] The term 'cumac' is an abbreviation for 'cumulative and recalculated' in French. The number of kWh_{cumac} saved following the installation of an energy efficient appliance therefore corresponds to the cumulative total of the energy saved each year during the appliance's life cycle. In addition, the energy savings each year after the first are recalculated by dividing the previous year's savings by 1.04 (4 % recalculation rate).

The French scheme supports a number of measures, not all of which can be counted under the terms of the Directive:

- certificates issued under the training, information and innovation program, bonuses put in place to combat energy-related poverty, overall renovations and the overseas departments cannot be counted.
- Operations concerning renewable heat energy, the transport and distribution of energy, in particular for biomass heaters and stand-alone wood burners and those on heat grids.

10.1.2 Energy saving calculation (methods) and data requirements

ESCs are awarded for energy savings achieved in projects that can either be 1) from a catalogue of "standard operations" or 2) case-by-case i.e. "special operations" where the savings must be calculated more precisely. The database http://www.developpement-durable.gouv.fr/3-Le-secteur-de-l-industrie.html includes 37 standard operations for the industry sector but specific operations are mainly set-up by "eligible" parties from this sector. So far, special operations represent 4% of the ESCs delivered and 80% of ESCs delivered for special operations were implemented in the industrial sector.

10.1.3 Monitoring and verification process

The validation process has been simplified for the new period (2015-2017). All justifying documents are no longer transmitted to the administration, but kept (for 6 years) by the party applying for certificates, at disposal for control purposes. Obligated or eligible parties submit standard files (including an attestation by the final customers) to the PNCEE that issues the certificates, once for the whole lifetime energy savings (hence the 4% discount rate). An official registry monitors the certificates issued and traded. It is directly used to verify the target achievements at the end of the 3-year period (no additional reporting). The PNCEE will perform controls on samples of files. In case of non-compliance, the certificates are cancelled and sanctions may be applied (4 c€/kWh cumac).

The main data sources for monitoring implemented energy efficiency measures in different sectors are statistical offices, national databases, and data from paid subsidies. Bottom-up methods (modelling, surveys, etc.) and other tools to measure, monitor and report results are in use according to the requirements of the energy efficiency measures. Moreover, top-down evaluations are utilized in order to assess energy efficiency trends in the different consumption sectors and to estimate the fulfilment of 2016 energy efficiency targets from the ESD.

The institutions, which are involved as administrative authorities, are also responsible for the data collection process.

France works with a set of standard measures containing predefined calculations in order to simplify the declaration process and eliminate the need for precise monitoring of an installation. The savings attributed to the project are based on an average established by the installers and users of that technology. Standard project proponents are not required to submit usage data or savings measurements for the operation when requesting ESCs.

Concerning the "special projects", with no standard calculation as a basis, PNCEE asks for data to back up their savings hypotheses (but it is not explicitly required). As a result, most submissions of "special" projects tend to include from 2-3 months' worth of monitoring data to justify their calculations. Given that these submissions require one year to be treated and can often involve a significant volume of ESCs, the project proponents prefer to submit the data to ensure their submission is as complete and transparent as possible. This means that the submissions typically take place at least 3 months after the project is completed, to allow time for this data to be collected. As such, this is the only monitoring that takes place in the French scheme.

ESCs are awarded for energy savings achieved in projects that can either be

- from a catalogue of "standard operations" or
- case-by-case i.e. "special operations" where the savings must be calculated more precisely.

For the case of standard operations, individual information sheets for measures are developed and proposed by different stakeholders participating in the ESC scheme (professional bodies, industrials etc.). Once the proposed operation is accepted and verified for technical accuracy by ADEME and after being validated by the Ministry, the standardized measure is published for official use in the scheme in a ministerial decree in the French "Journal Officiel". Currently there are 304 possible standard energy saving measures, defined such as condensing boilers, roof insulation or double glazing operations, included in the official catalogue. The French administration regularly updates the list so as to account for technical progress by 1) removing measures that no longer provide significant savings as compared to the regulated standard, 2) modifying existing measures to better represent the present circumstance, and 3) adding newly approved measures. The full list of standardised measures is provided in the following link: http://www.developpement-durable.gouv.fr/1-le-secteur-du-batiment.html.

Special operation requests are sent to the National Authority for Energy Saving Certificates (PNCEE), which validates the requests for ESCs with support from ADEME on the highly technical portions of the project.

The ESCs are only awarded to a qualified project proponent (an obligated or eligible party) after a professional installer finishes the operation and the PNCEE validates the eligible energy savings.

The PNCEE reserves the right to audit works that have received ESCs at a future time. As such, beyond the desk based verifications at the PNCEE, there is no on-site verification of the energy savings to ensure that the equipment is properly installed and that the savings are actually being realized. The only certitude is that the installer and beneficiary attest that the energy saving measure has been implemented. In addition, when there is a suspicion of cheating, in-depth controls are undertaken within the framework of a judicial procedure.

At the end of each period, the PNCEE verifies that each obligated party holds at least the amount of ESCs on the Emmy, the national white certificates electronic registry, as is required by their obligation.

The most dominant verification methodology being used to certify energy savings in white certificate schemes in France is the deemed savings. This approach follows using an ex-ante methodology,

taking into account defaults for free riding, delivery mechanisms and persistence. The standardized savings are being updated according to the evolution of the baseline. Nevertheless, the modifications do not affect the previously certified measures.

For the strategic measures, each monitoring actor uses its own verification process. The reporting period of the M&V schemes depends on the considered energy efficiency measure. As far as the ESC scheme is concerned targets are set for each obligated party for a three-year period. Within this period, there are no annual deadlines to be respected, the targets being verified only at the end of the period.

10.2 Load management bonus for operators[33]

10.2.1 Short description of the policy measure

The law n° 2010-1488 from December 2010 (*loi NOME* that stands for *Nouvelle Organisation du Marché de l'Electricité*) has first introduced the obligation for electricity suppliers to guarantee shedding and/or supply capacities. A bonus for load management operators was put in place by the Law of 15 April 2013 on preparing the transition to a low-energy system. The bonus was planned to be financed through the contribution to public electrical utilities, aiming to reward 'benefit to the community, in particular through energy demand management or moderation of energy use'.

The Energy Regulation Commission (CRE) is the implementing public authority

Type of policy measure	Financial
Lifetime of the measure	✓ 2013 -
✓ Target groups	✓ Industry, residential, tertiary
✓ Target technology	✓ Not specified
✓ Target energy savings	✓ Not specified

Table 27. Main features of the French load management bonus

[33] Information on the load management bonus was obtained from the official EC notification of France (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures). Decree n° 2016-1132 from August 2016 updating the French Energy Code regarding rules for shedding valorization on energy and balancing markets or through call for tenders from the administrative authority Décret n° 2016-1132 du 19 août 2016 modifiant les dispositions de la partie réglementaire du code de l'énergie relatives aux effacements de consommation d'électricité

10.2.2 Energy saving calculation (methods) and data requirements

A Council of State Decree will set the parameters for calculating this bonus. In accordance with the law, a draft decree was presented by the CRE on 24 July 2013. It was revised on 17 October 2013 based on the opinion of the High Council for Energy (CSE). The CRE proposes, in particular, evaluating energy savings based on the average price observed on the energy efficiency certificates market.

A method for ex post verification of managed loads has been drawn up by RTE France (Electricity Transmission Network). The question of the share of load management leading to delayed consumption (and therefore not representing energy savings) has been studied by the CRE, but this study must be continuously expanded to take into account lessons learned. For more details on the bonus, available information is https://clients.rte-france.com/lang/fr/clients_producteurs/services_clients/dispositif_nebef_montant.jsp. The feedback is limited thus on the savings of the scheme.

10.2.3 Monitoring and verification process

Monitoring, verification and supervision is the responsibility of RTE.

11 Germany

11.1 Investment support programs in companies[34]

11.1.1 Short description of the policy measure

The following investment support programs are available in companies:

- KfW Energy Efficiency Program
- KfW Renewable Energies Standard / Premium
- BMWi Efficiency Fund: Promotion of energy-efficient cross-cutting technologies in SMEs / promotion of energy-efficient and climate-friendly production processes

The KfW energy efficiency program provides financing for energy efficiency measures in various areas including building and energy technology, building envelopes, machinery, process cooling and heating, heat recovery/waste heat utilization, measurement, regulation and control technology, information and communication technology, procurement of low-emission commercial vehicles, as well as the associated costs for planning and implementation support for SMEs. The anticipated energy savings must be calculated before the application is filed; minimum requirements exist with regard to the level of saving (for new investments: 15% less than the average for the industry; for replacement investments: 30 % less than the mean consumption for the last three years).

Under the KfW Renewable Energies (Standard/Premium) program, funding is available for projects that use renewable energy sources to generate electricity and where electricity/heat is generated in combined heat and power plants. Funds are provided in the form of low-interest loans and partly also through redemption loans.

The two programs, 'Promotion of high efficiency cross-cutting technologies in SMEs' (funding for e.g. energy-efficient pumps, drives or compressed-air systems in the form of investment grants) and 'Promotion of energy-efficient and climate friendly production processes in the manufacturing sector', were launched under the Energy Efficiency Fund of the Federal Ministry of Economics and Energy [Bundesministerium für Wirtschaft und Energie — BMWi].

Type of policy measure	Financial incentive
Lifetime of the measure	✓ 2009/2012 – end not specified

[34] Information on the investment support programs was obtained from the official revised EC notification of Germany (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

Type of policy measure	Financial incentive
✓ Target groups	✓ Companies
✓ Target technology	✓ Building envelope, building services, lighting, stationary drives, thermal cross-cutting technologies, processes
✓ Target energy savings	✓ 123.2 PJ total saving (2014-2020)

Table 28. Main features of the German investment support programs

11.1.2 Energy saving calculation (methods) and data requirements

To calculate energy savings, an energy saving per euro employed, estimated for each type of use. For the forward projection, the investment volume triggered by the measure is taken as the driving variable for the final energy saving. For the purpose of projecting the investment volume, it is assumed that the program will trigger annual investments in the order of EUR 3.5 billion (cf. Annex: Methodological parameters for investment support in companies). The range of the saving in question varies considerably because of the variety of application systems used. The studies referred to contain values of between 0.02 and 5 kWh/a per € invested. In the area of cross-cutting technologies and production processes, a value of 0.75 kWh/(a*€) was estimated as a realistic value.

11.1.3 Monitoring and verification process

The monitoring is responsibility of the Federal Statistics Office, but to a large extent is covered by data established in a public private partnership, the "Working Group on Energy Balances" (AGEB). This working group combines energy suppliers, research institutes, several federal offices, the Federal Office for Statistics and is led by the Federal Ministry of Economic Affairs and Energy.

AGEB data is used to monitor and analyse the major energy efficiency trends at federal level. Regional and local data are fed into this working group via the Federal Statistical Office that acts as coordinator for the statistical offices of the federal states, which, in turn, consolidate local data in a similar working group on regional energy statistics. The final set of data is updated monthly and published by the Federal Ministry of Economic Affairs and Energy. In addition, reports and analyses provided by research consortia are regularly taken into account.

At federal state level, monitoring and verification is not harmonized. This implies that depending on the political focus of a federal state the monitoring and verification varies and places an emphasis on parameters like budget spent, number of measures implemented (e.g. number of energy audits installed, number of energy networks put in place, number of energy counselling sessions solicited), energy savings or CO_2 impact. With several federal states having adopted regional climate protection programs or even regional climate protection laws, a strong focus is usually placed on avoided CO_2 emissions rather than energy savings. This is for example the case in North Rhine-Westphalia and Baden Wuerttemberg. Like at federal level, both regional policy strategies and the individual programs and measures are usually assessed through research consortia.

At local level, a systematic tracking of energy efficiency is not comprehensively implemented. Whereas all major local entities like bigger cities or agglomerations collect and monitor energy data, the review of energy saving programs is not systematically installed. Rather than tracing energy savings many local governments stick to the regional focal point of climate policies and monitor the CO_2 reduction efforts of their constituency. This however includes a broader set of measures ranging from the deployment of renewable energies, energy efficiency to adaptation measures. In the case of North Rhine-Westphalia and Baden Wuerttemberg the responsible federal state ministries have provided the communes with licenses for an online CO_2 measuring tool which collects the CO_2 reduction efforts in a harmonized way.

11.2 National Climate Protection Initiative[35]

11.2.1 Short description of the policy measure

The initiative was designed to promote climate protection measures with regard to commercial refrigeration systems, micro-CHP installations and electricity projects for municipalities. Funding is provided for a status check of refrigeration systems (above a certain size) in operation, the modernization of refrigeration systems and the construction of new efficient refrigeration systems (basic funding), and waste heat utilization measures (bonus funding). Funding is also made available to boost the use of micro-CHP plants within the capacity range up to 50 kW in the heating market through investment incentives and for various projects targeting the efficient use of energy in the municipalities under the policy for municipalities of the National Climate Protection Initiative.

Type of policy measure	Policy Support, Strategic planning/ financial incentives
Lifetime of the measure	✓ 2009 – end not specified
✓ Target groups	✓ Companies, building owners as well as municipalities within the following sectors: Commerce, trade and services; industry; private households; public authorities
✓ Target technology	✓ Refrigerator systems, micro-CHP plants, stationary drives, thermal cross-cutting technologies, processes
✓ Target energy savings	✓ 3.1 PJ total saving (2014-2020)

Table 29. Main features of the German National Climate Protection Initiative

[35] Information on the investment support programs was obtained from the official revised EC notification of Germany (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

11.2.2 Energy saving calculation (methods) and data requirements

Scaled savings are calculated based on expected future support volumes. The basis used for determining the contribution by the National Climate Protection Initiative programs to the general promotion of investments in energy efficiency is the evaluation of the National Climate Protection Initiative (Öko-Institut et al. 2012). As we must assume that all micro-CHP installations receive the CHP bonus, no saving is allocated here to avoid this measure being counted twice.

11.2.3 Monitoring and verification process

See above.

11.3 Energy and electricity taxes[36]

11.3.1 Short description of the policy measure

The Energy Tax Act [Energiesteuergesetz] and the Electricity Tax Act [Stromsteuergesetz] govern the taxation of various energy sources such as fuel oil, petrol, diesel, natural gas and electricity. It is expected that the increase of these taxes will influence the behaviour of final consumers towards an increased use of energy-efficient technologies and economical use of energy.

Type of policy measure	Taxes
Lifetime of the measure	✓ 1999/2006 – end not specified
✓ Target groups	✓ Cross-cutting
✓ Target technology	✓ Building envelope; building services (heating, ventilation, air conditioning); lighting; appliances (white goods, domestic appliances); appliances (brown goods, consumer electronics); appliances (grey goods, information and communication); mobile drives
✓ Target energy savings	✓ 511 PJ total savings (2014-2020)

Table 30. Main features of the German energy and electricity taxes

[36] Information on the investment support programs was obtained from the official revised EC notification of Germany (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

11.3.2 Energy saving calculation (methods) and data requirements

Considering and applying the methodological specifications in Article 7 in conjunction with Annex V No 3 EED produces an incentive effect and, from this, a contribution towards attaining the savings target set out in Article 7 EED. In accordance with the provisions of Annex V No 3(a), the minimum requirements laid down in Council Directive 2003/96/EC of 27 October 2003 have been used as a baseline/reference. This means that energy savings resulting from the influence of higher tax rates on energy sources/electricity compared to this reference over the period of the EED, count towards the attainment of the savings target laid down in Article 7 EED. This considers the effect of energy and electricity tax on final consumption broken down by sector, use and energy sources (similar to the approach in BMWi 2011). The trend in energy prices has been taken from the Federal Government's energy scenario II B (cf. Prognos/EWI/GWS 2010, Table 2.2-3 and Table A 1-18). The taxable consumption of the individual consumer categories is taken from the usage balances of the Working Group on Energy Balances, also making use of the energy balance in some cases (this relates to consumption in the transport sector, as aviation is not generally subject to energy tax; in the industrial sector, it relates to the breakdown between heavy and light fuel oil). In the industrial sector, grounds for exemption are also taken into consideration under the peak tax adjustment scheme. The tax reduction based on the subsidy report from the BMF is used for this. The price elasticity values used come from BMWi 2011.

11.3.3 Monitoring and verification process

See above.

11.4 KfW Energy consultations for SMEs[37]

11.4.1 Short description of the policy measure

The purpose of the KfW energy consultations for SMEs is to highlight weaknesses in the use of energy in SMEs, and provide proposals or specific action plans for improvements to save energy and costs. Grants are awarded for qualified and independent energy efficiency consultations in SMEs. SMEs can receive funding for an initial consultation and/or a detailed consultation lasting several days.

Type of policy measure	Financial
Lifetime of the measure	✓ 2012 – end not specified

[37] Information on the investment support programs was obtained from the official revised EC notification of Germany (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures)

Type of policy measure	Financial
✓ Target groups	✓ SMEs crosscutting
✓ Target technology	✓ Not specified
✓ Target energy savings	✓ 41 PJ total saving (2014-2020)

Table 31. Main features of the Hungarian Energy efficiency law

11.4.2 Energy saving calculation (methods) and data requirements

The methodological approach is based on BMWi 2011, taking account of the individual independent program evaluations. The savings are then quantified on the basis of the subsequent individual investment measures triggered by the consultations. In terms of the methodology, it is also taken into account that not every consultation results in the implementation of the individual measures proposed. With regard to the forward projection, the average of the last three available years is taken as a basis. For the energy-related and energy efficiency checks by the consumer organizations (which were not started until October 2012), an annual volume of 10 000 consultations and an annual saving identical to that for the energy efficiency check by Caritas are assumed as an evaluation is not yet available for this measure.

11.4.3 Monitoring and verification process

Same as above

12 Greece

12.1 Incentives for obligatory implementation of Energy Management Systems[38]

12.1.1 Short description of the measure

This measure aims to the implementation of Energy Management Systems (EMS) in all industries that are not included in Energy Services Directive (ESD).

The EMS will be implemented in four stages: 1. Planning: determine which targets and processes are needed to achieve results corresponding industry requirements and policy. 2. Implement: implement the processes. 3. Monitor: monitor and measure processes and product based on policy, targets and requirements and report the results. 4. Act/ Improve: implement measures to ensure a continual improvement to the processes performance.

Type of policy measure	Financial, Legislative/Informative
Lifetime of the measure	2008-2016
Target groups	Industry
Target technology	Energy Management Systems
Target energy savings	1% energy savings

Table 32. Main features of the Incentives for obligatory implementation of Energy Management Systems

12.1.2 Energy saving calculation (methods) and data requirements

The EMS will include:

1. Documentary way of implementation
2. Continuously redesign in order to determine the critical parameters-indicators which concern the industry energy performance

[38] Information on the Incentives for obligatory implementation of Energy Management Systems was obtained from the official revised EC notification of Greece (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), and the MURE database (www.measures-odyssee-mure.eu/public/mure_pdf/industry/GRE6.PDF).

3. Creation of suitable structure, energy manager determination, allocation of commitments and initiatives
4. Creation and maintenance of energy records, production data, objectives and indicators
5. Energy Audits
6. Training/ information of employees in energy efficiency issues, 7. Evaluation of EMS procedures and functions
7. Review of EMS implementation and improvements for increasing the system performance.

12.1.3 Monitoring and verification process

The reporting period of the M&V schemes is determined by the requirements of the Operational Programs and the National Strategic Framework for the programming periods of 2007-2013 and 2014-2020. Specifically, this reporting period requires the monitoring of the financed action by 6-month period with the submission of standardised reports and the quantification and monitoring of specific indicators.

The relevant legal framework will obligate industries to determine which aspects cause significant impact on the use of energy. Industries will establish and maintain procedures for the identification and assessment of such energy aspects as are caused by industry activities/operations, products and services, and can be governed and influenced by the organisation. Industry will keep this information updated. The assessment will be documented and contain:

1. Past and present energy use, based on measurements and other data. When updating the assessment, the significant energy use will, to an increasing extent, be bases on measurements.
2. An identification of equipment or systems with significant energy use.
3. An identification of staff whose work can influence the use of energy to a considerable extent.
4. Identification of opportunities for improvement.

12.2 Installation of electronic and intelligent metering of electricity and natural gas industrial consumers[39]

12.2.1 Short description of the measure

The measure aims to the installation by the energy suppliers of electronic meters with time measuring and telemetric capability and direct charting of the energy behaviour of consumers in order to be able to give the consumers better information; and the installation of intelligent meters with the ability to monitor the energy consumed, the carbon dioxide emissions produced and the consumption of each appliance. The indications / information are provided through appliances sited next to the electronic meter or are sent to mobile phones or personal computers.

Type of policy measure	Financial, Information/Education/Training
Lifetime of the measure	Since 2009
Target groups	Crosscutting
Target technology	Smart metering
Target energy savings	96.8 ktoe (for all sectors combined)

Table 33. Main features of the Installation of electronic and intelligent metering of electricity and natural gas industrial consumers

12.2.2 Energy saving calculation (methods) and data requirements

Determination of the energy saving requires the application of a documented system for the collection and processing of information to permit monitoring and evaluation of the implementation of the measure. The monitoring of the energy efficiency measures is performed through the establishment of specialized bottom-up procedures. These procedures were developed from the Ministry of Environment and Energy.

12.2.3 Monitoring and verification process

The reporting period of the M&V schemes is determined by the requirements of the Operational Programs and the National Strategic Framework for the programming periods of 2007-2013 and

[39] Information on the Installation of electronic and intelligent metering of electricity and natural gas industrial consumers was obtained from the official revised EC notification of Greece (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), the D3.1 report of the ENSPOL project (http://enspol.eu/results), and the MURE database (www.measures-odyssee-mure.eu/public/mure_pdf/industry/GRE8.PDF).

2014-2020. Specifically, this reporting period requires the monitoring of the financed action by 6-month period with the submission of standardised reports and the quantification and monitoring of specific indicators.

According to Law 3855/2010, Article 15. Paragraph 1, energy distributors must provide to end users individual meters that reflect their actual energy consumption and additional information about saving energy. The Public Power Corporation has already completed pilot installation of meters, with the mentioned characteristics, to 9,000 consumers MV (tertiary sector and industry). Furthermore, PPC in April 2010 announced a program that will install 220,000 meters on low voltage consumers. The 60,000 will be installed in large commercial consumers. The meters will record the actual consumption of the consumer and send the data to a central system of PPC which will be collected and processed."

13 Hungary

13.1 Energy Efficiency Obligation Scheme – The Energy efficiency law[40]

13.1.1 Short description of the policy measure

The Energy efficiency law (with number LVII.) was adopted in May 2015 by the Hungarian government in accordance with the EU`s energy efficiency directive. The law aims to reach a 1.5% energy end-use saving per year on the national level.

The law obligates large companies to carry out energy audits in every 4 years. The law with its implementing regulation[41] sets the requirements for energy auditing and its contents. Information for end-users and market actors about energy efficiency and energy saving methods as well as the related financial and legal aspects need to be provided via a regularly updated energy efficiency information website. The website will also provide the opportunity for energy efficiency service providers and financial organizations to publish information about their services for consumers.

Type of policy measure	Obligation, regulation
Lifetime of the measure	✓ 2016 - ongoing
✓ Target groups	✓ Energy producers (and public buildings)
✓ Target technology	✓ No restrictions
✓ Target energy savings	✓ End-use energy saving of 1.5% in 2018-2020 (1.25% in 2016 and 2017)

Table 34. Main features of the Hungarian Energy efficiency law

13.1.2 Energy saving calculation (methods) and data requirements

According to the law, energy savings should be achieved by the use of

- taxes on energy or CO_2
- financial incentives
- regulations or voluntary agreements
- introduction of norms for products and services

[40] http://njt.hu/cgi_bin/njt_doc.cgi?docid=175684.293397

[41] http://njt.hu/cgi_bin/njt_doc.cgi?docid=175714.293462

- energy labelling
- educational, information programs
- combination of the above.

The following methods can be used for the calculation of energy savings:

- preliminary approach where estimated energy savings are calculated based on earlier verified improvements in similar facilities
- ex-post approach where the energy saving is actually calculated based on the recordings of actual reductions in energy use, taking into account other factors as well such as additionality, production levels, utilization rate, weather conditions (factors that might influence energy use)
- Economies of scale where technical estimates are applied for determining the savings. This can only be applied if the determination of data is difficult or too costly
- Savings estimated by using surveys. This can only be used for savings that are achieved due to changes in consumers' behaviour as a result of information campaigns, increased energy labelling or smart metering.

Considering data requirements, obligated parties first of all need to provide cost-benefit analyses to the Hungarian Energy and Public Utility Regulatory Authority (HEA). The background data and information used for the development of the cost-benefit analyses should be readily available upon requesting from the Authority and the input data for these analyses need to be provided upon requesting of the HEA.

Obligated parties need to carry out energy audits every 4 years. Companies that already run an accredited energy management system according to the EN ISO 50001 standard are exempt from this mandatory auditing. In this case the company only has to send the valid certification (proving accreditation) to HEA.

The energy audit needs to contain data on energy use (including the energy use profile of buildings and transport), it has to be based on life-cycle cost analyses to facilitate long-term investments and savings and it should give a reliable picture about the overall energy efficiency. The audit has to also include the following information: the type of fuel used and related costs, energy-use trends, baselines, identified energy inefficient aspects where later improvements could be made, discussion on what are the possibilities to improve energy efficiency and to use renewable energy sources or new more advanced equipment. The potential of energy efficiency measures should be verified with detailed calculations. It should also be described what steps are needed to take to implement these measures and what are the related costs and payback times of investments in these measures. The energy audit should determine the interventions according to the following categories: simple (does not require investments), cost-optimal (profitable without any other support) or costly (only realistic with grants or other financial support).

13.1.3 Monitoring and verification process

The HEA monitors the energy saving progress of obligated parties. It also stores and publishes the achieved energy saving data, develops a list of all energy auditors and auditor organizations, and monitors their activities. It is also responsible for running the energy efficiency information website, assessing the energy efficiency potentials and opportunities for the electricity and gas networks, approves cost-benefit analyses of obligated parties and determines exemption of thereof.

HEA monitors whether the energy auditing is taken place and developed according to the requirements. The verification process takes about 6 months that one time can be further extended with 3 months. The Agency shall impose a fine up to 10 million HUF on companies that do not provide their energy audit 90 days after the official request or do not cooperate during the verification process. If necessary, the fine can be re-imposed with a maximum of 150% of the original fine (maximum 15 million HUF). In case the HEA finds that the audit does not fulfil the requirements, the auditor or auditing organization have 3 months to correct the identified issues. Auditors and auditor organizations might be also fined if they do not cooperate during the verification process, issues are not solved after the given 3 months or they provide a false energy audit. In case an auditor or organization is fined 5 times within 5 years, the 6th times the HEA would not impose another fine but would prohibit the further auditing activities of that auditor or organization. If issues are not solved within the 3 months, the energy audit will be classified as invalid and a new energy audit has to be submitted within 6 months after the notification of invalidity.

If requested, HEA also verifies energy audits of non-obligated companies for a certain fee.

The Agency does not issue a fine until 31 December 2016 for non-compliance (not submitting a mandatory energy audit).

14 Ireland

14.1 Energy Efficiency Obligation (EEO) scheme[42]

14.1.1 Short description of the policy measure

Obligated parties under the EEOS are energy suppliers that have market sales in Ireland of greater than 600 GWh final sales in any relevant year, regardless of the sector they supply. Obligated parties' targets are allocated according to their proportion of energy market sales volume in Ireland. The target allocated to obligated parties is 550 GWh PEE (primary energy equivalent) annually, which is about half of the net annual savings to be achieved in total. The target allocated to obligated parties is split to 75% for non-residential sectors, 20% residential sectors and 5% residential sectors with fuel poverty.

Ireland intends to operate the EEO scheme in three periods up to 2020. The first spans 2014 - 2016, the second 2017-2019 and the third 2020. The three year cycle has worked well in the voluntary period (from 2011 to 2013) and it allows energy suppliers and providers of energy saving credits to adequately plan their activities. Ireland will actively keep under review the minimum entry threshold after which the obligation applies.

Type of policy measure	Obligation
Lifetime of the measure	2014-2020
Target groups	Energy suppliers (electricity, gas, oil, and solid fuel)
Target technology	No restrictions
Target energy savings	550 GWh per annum

Table 35. Main features of the Irish EEO

14.1.2 Energy saving calculation (methods) and data requirements

In the non-residential sectors, energy savings are calculated on a project-by-project basis. In these instances the Sustainable Energy Authority of Ireland (SEAI) use a scaled savings model. Technology assessment tools to aid in savings estimates are provided on the SEAI website. The following tools are available:

- Energy Savings Calculator for Boiler Replacement Projects

[42] Information on the EEO was obtained from the official EC notification of Ireland (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results)

- Electric Motors and Variable Speed Drives Evaluation Tool
- Tubular Fluorescent Lighting and Controls Evaluation Tool.
- Pump Energy Efficiency Calculation Tool.
- Pumps Best Practice Tool.
- Compressed Air Best Practice Tool.
- Motors Best Practice Tool.
- Register of Opportunities.

Metered savings will primarily correspond with non-residential new and innovative initiatives, where it is not clear in advance what savings will result from their installation.

Data required for savings calculations include inputs such as the projected annual operational hours of the technology, and rated efficiency and electrical output of the technology.

14.1.3 Monitoring and verification process

Responsibility for compliance with the Directive provisions rests with the energy supplier responsible for realising the necessary energy savings credits, backed up by appropriate independent verification and audit by the SEAI. In the first instance, energy suppliers will be required to develop and implement a quality control process that will ensure that any energy savings claimed against their target are reliable, verifiable and undertaken to an appropriate standard.

Ireland intends to require energy suppliers to have an appropriately qualified energy auditor sign off on all energy savings reported against an energy suppliers' target. As any energy savings that are rejected following an SEAI audit will be discounted from energy suppliers' target, which potentially could lead to the imposition of a financial penalty, it is in the energy suppliers' own interest to ensure that submitted energy savings are compliant for the purposes of the Directive.

The main elements of the verification procedure comprise:[43]

- High quality software assistance for the measurement of the achieved energy savings from each measure.
- Validation rules integrated into the reporting software.
- Requests to submitters and on-site reviews.
- Auditing by SEAI a statistically significant sample of measures within EEOS.
- Each EEO party within shall measure and verify the energy savings of projects using an agreed internationally recognised measurement and verification protocol as agreed with the

[43] multEE deliverable D1.2: Synthesis report on M&V schemes and coordination mechanisms in EU Member States. http://multee.eu/system/files/D.1.2_Mapping%20Synthesis%20report.pdf

SEAI, and shall report them to the SEAI in the manner and at the frequency required by the SEAI.

- Agreement in advance shall be done between the obligated parties in the EEOS and the SEAI considering the verification method of energy savings in the case of complex project.
- The obligated parties in the EEOS must prepare specific Quality Assurance Schemes.

14.2 Large Industry Energy Network (LIEN)[44]

14.2.1 Short description of the policy measure

The Large Industry Energy Network (LIEN) is a voluntary network, facilitated by SEAI, of companies working to maintain strong energy management and environmental protection practices. Companies joining the LIEN commit to develop an energy management program, setting and reviewing energy targets, undertaking an annual energy audit, and producing an annual statement-of-energy account. Regular workshops, seminars and site visits enable LIEN members to learn from energy experts and other specialists, and share knowledge and experiences with other energy managers. In total 166 companies participate in the LIEN, and LIEN members account for approximately 51% of Ireland's national industry primary energy requirement.

Type of policy measure	Information/education/training
Lifetime of the measure	2014-2020 (originally started in 1995)
Target groups	Industry and SMEs
Target technology	No restrictions
Target energy savings	3153 GWh by 2020

Table 36. Main features of the Irish LIEN instrument

14.2.2 Energy saving calculation (methods) and data requirements

A top down approach is applied to the portion of industry energy consumed by the LIEN members. Energy intensity and output together with details of energy efficiency improvement measures (bottom-up, reported by participant companies) is used to establish savings rate achieved with participant companies to date. Decomposition analysis is undertaken of projections for the total primary energy requirement of Irish industry and the proportion covered by participant companies. A Paasche index is being developed to project future programmatic savings.

[44] Information on the LIEN was obtained from the official EC notification of Ireland (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures).

14.2.3 Monitoring and verification process

Each of the 135 member companies submits an annual statement of energy accounts to SEAI, giving an Energy Performance Index (EPI). The EPI is based on the ratio of annual primary energy consumption to aggregate product output (normalised to 100 in the year of joining LIEN). These accounts are then collated, analysed and the energy savings are reported on in the LIEN annual report each year. The annual report quantifies the energy savings of the whole LIEN program but does not explain the methodology to calculate the savings, or the proportion of the savings that could be attributed to participation in LIEN.

15 Italy

15.1 White certificate obligation scheme (WhC)[45]

15.1.1 Short description of the measure

The Italian white certificate mechanism is an EEO scheme with a tradable market and works both as an EEO and as an incentive scheme for voluntary parties. White certificates are used to certify the achievement of energy saving in the final uses of energy through energy efficiency measures and projects. The economic value of the certificates (originally set at 100 €/TEE) varies depending on the cost of energy and is a function of market trends. The obligation scheme was introduced by the legislative decrees that liberalized the electricity and the natural gas markets (Ministerial Decrees of 20 July 2004).

In 2012, the Italian National Energy Strategy (Strategia Energetica Nazionale - SEN) was approved and published, assigning white certificates the task of covering about one third of the new energy savings that need to be achieved by 2020.

The system rests on the obligation for electricity and gas distributors (DSOs) with more than 50,000 end users to generate each year a certain amount of savings or, alternatively, to purchase an equivalent amount of certificates.

Type of policy measure	Obligation
Lifetime of the measure	2004 - ongoing
Target groups	All sectors including industry
Target technology	All energy efficiency technologies (improvement of the energy performance of electric power plants excluded)
Target energy savings	16.03 Mtoe (cumulative saving in the period of 2014-2020)

Table 37. Main features of the white certificate obligation scheme

15.1.2 Energy saving calculation (methods) and data requirements

There are three methods for the calculation of energy savings:

[45] Information on the WhC was obtained from the official EC notification of Austria (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results)

1. Deemed savings projects (DSP) are projects that do not require meters because the savings are recognized depending on the number of installed units (e.g. number of lamps or small boilers, square meters of solar thermal collectors, kW of installed high efficiency engines, etc.). The corresponding savings are indicated in the related file issued by the GSE (technical sheets), which also set the baseline for the additionality, the corrective factors (e.g. geographical location, climate zone, working hours, etc.), and the documentation that shall be presented by the proponent.
2. Simplified monitoring projects (SMP) are projects that require one or more meters and whose savings are granted based on the monitoring plan indicated in the related file issued by the GSE (technical sheets), which also set the baseline for the additionality, the algorithm to calculate the savings, and the documentation that shall be presented by the proponent.
3. Monitoring plans projects (MPP) are projects for which deemed savings and simplified monitoring projects are not applicable. In this case the proponent shall previously present a PPPM (Proposed Project and Program of Measures). After the PPPM is approved by GSE the proponent can ask for WhC with an RVC. In this kind of projects (similarly to SMP), the number of WhC is proportional to the real reduction of consumption periodically monitored and measured (at least once per year).

Data required for the calculation of savings are

a) Standardized method based on technical data sheets that set out preliminarily the specific saving of the single reference physical unit. In analytical projects, certain physical parameters are measured and the savings are obtained analytically by means of standardized methodological sheets. It needs to include for example a calculation algorithm, the number and typology of the new components (minimum allowed saving: 20 tep).
b) As for a) method, plus efficiency verification through real measures during the "useful life" of the components (minimum allowed saving: 40 tep/1st year).
c) Based on real measurements according PPPM (minimum allowed saving: 60 tep/1st year).

15.1.3 Monitoring and verification process

Obligated parties need to hold a number of certificates that corresponds to their assigned obligation. Compliance is monitored and verified on a yearly basis by GSE (Gestore Servizi Energetici; Italian energy service operator) with the assistance of ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) and RSE (Ricerca Sistema Energetico; Energy service research center). ENEA supports GSE in the verification process to check the technical and administrative execution of projects that generated the energy savings and obtained the certificates. GSE must submit to the MSE (Ministry of Economic Development) and MATTM (the Ministry of the Environment and Protection of Land and Sea) for approval of an annual program of checks. GSE regularly checks the execution of the project and must send an annual report on checks to MSE, MATTM, GME (the Authority for Electricity and Gas) and the Unified Conference of the State, Regions and Local Authorities on activities and on projects implemented, including their geographical location, data on the savings achieved in the year (in Mtoe), the volume of certificates issued and the forecasts for the subsequent year based on the projects submitted and the ratio between the

cumulative volume of the certificates and the value of the national obligation, both referred to the previous year. GSE also reports to the same authorities on certificate trading performance and any forms of behaviour detected in the trading transactions that fail to comply with the principles of transparency and neutrality to the same authorities. Site visits and inspections may be carried out at the installation site both during project implementation and throughout its lifetime, to check correct fulfilment of the obligations linked to the certificates. In case the assigned obligations are not met, penalties will be imposed for each missing security, pursuant to Law No 481 of 14 November 1995.

15.2 Energy audits for non-SMEs

15.2.1 Short description of the measure

Energy audits for non-SMEs are mandatory under the EED art.8 while for SMEs it will be only voluntary starting in 2016 in cooperation with the regional governments. It is based on the Legislative Decree of 102/2014.

Type of policy measure	Legislative
Lifetime of the measure	2015 – ongoing
Target groups	All sectors including industry
Target technology	All energy efficiency technologies
Target energy savings	Not estimated yet but could be very significant

Table 38. Main features of the measure energy audits for non-SMEs

15.2.2 Energy saving calculation (methods) and data requirements

All enterprises have to provide information on energy consumption divided by energy source and breakdown among main processes, process services (e.g. compressed air, steam production, etc.) and general services (e.g. offices, warehouses, etc.). Energy saving estimations need to follow the requirements of EN 16247.

15.2.3 Monitoring and verification process

Monitoring and verification process is requested under legislative decree 102/2014 under art. 7. ENEA (Italian agency for new technologies, energy and economic sustainable development) is in charge of monitoring and verification. It provides reports on the main results (number of audits, sectors audited, average number of sites, etc. - data already available) and on sectorial outcomes (e.g. typical EE measures, average savings, etc. - presently ongoing). Non-compliant enterprises are communicated to the Ministry of economic development that issues the appropriate fines (already done for non-compliant energy intensive industries).

16 Latvia

16.1 Obligation on improving energy efficiency by promoting the implementation of industrial energy audits and energy management systems in companies[46]

16.1.1 Short description of the policy measure

Currently, there are two main groups of companies that have an obligation to implement solutions to improve their energy efficiency. The first is large enterprises i.e. companies that have >249 full-time employees, and their revenues >50M euro and total balance sheet >43M euro. The second group is SMEs that are classed as large electricity consumers i.e. electricity consumption >500MWh/y. Aforementioned groups have legal obligation to implement an energy management system, update their environmental management system or carry out an energy audit.

Type of policy measure	Obligation, cooperative, financial
Lifetime of the measure	2014-2020
Target groups	Industrial companies, SMEs
Target technology	Not specified
Target energy savings	807,6 GWh (cumulative)

Table 39. Main features of the Latvian energy efficiency obligation

The Governmental Regulations No.138, adopted in March 2013, lay down the procedure for carrying out industrial energy audits in large industrial enterprises, requirements as to the performance of industrial energy audits by legal entities, key requirements as to the conformity assessment of energy auditors, as well as the procedure for monitoring the compliance with these requirements. There is a requirement of at least 10% of energy efficiency improvement.

[46] Information for this measure is obtained from stakeholder consultation, the official EU notification of Latvia (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the multEE project deliverable D1.2: Synthesis report on M&V schemes and coordination mechanisms in EU Member States (http://multee.eu/system/files/D.1.2_Mapping%20Synthesis%20report.pdf)

16.1.2 Energy saving calculation (methods) and data requirements

Obligated parties need to provide a copy of a certificate for installing the equipment, at least 3 actions that they will take to improve energy efficiency in their company, and projected energy savings. Auditors will have to register audits using an online system. In regards to auditing reports, they are not standardised and methods are at auditors' discretion, however there are guidelines being developed that will point out what needs to be included in the audit. They are not standardised due to the wide range of differences in industrial sectors. The guidelines are planned to be available by the end of the summer.

There is data available from The Climate Change Financial Instrument (CCFI) financed project "Complex Solutions for Greenhouse Gas Emission Reduction in Manufacturing Buildings". This can be used to calculate the average savings (88.44 euro/kWh) in the state support program. The Latvian Environmental Investment Fund[47] was administering this program and has access to particular project/activity data.

Bottom-up methodologies are implemented for the measurement of the achieved energy savings. Deemed-savings method and the metered savings method are considered as the most suitable for Latvia. Metered savings method is already being used. Several financing programs have been implemented in Latvia, which assessed the energy savings using the ex-post method. This method is used to assess the energy savings from an individual or set of energy efficiency measures that correspond to any of the following features, namely the replacement of existing energy consuming equipment with newer and more efficient equipment, the improvement of existing energy consuming equipment or improvement of energy efficiency of the buildings and the installation of new efficient energy consuming equipment or construction of new energy efficient buildings. The correction factors triggered by external circumstances (climate conditions, load of usage of equipment or buildings, and other) are also taken into account. CMR No348 (2013) presents the methods for the calculation of the energy efficiency of a building. Finally, the deemed savings method is under development and shall be finalized soon, while a deemed energy savings catalogue has been developed.

Furthermore, top-down methodologies are also implemented. The total energy savings are calculated based on statistical indicators and their variation over time. Before performing top-down calculation procedure, the different factors impacting the numerical value of the indicators but not directly related to the energy efficiency issues, such as heating season degree days, change in production structure etc., are filtered out. EC's suggested indicators for energy savings calculation are used in the industrial, transport and residential sectors. EC's mandatory indicators are used in tertiary sector. The selection of particular indicators depends on the available aggregation level of the information necessary for the calculation. The main data sources for top-down method are data stemming from the Latvia Central Statistical Bureau and the ODYSSEE data base.

[47] http://www.lvif.gov.lv/?object_id=460

The development of the methodology and the indicators used was the result from the cooperation of the Ministry of Economics, the Ministry of Environmental Protection and Regional Development, the Institute of Physical Energetics, the Latvian Energy Efficiency Association and the University of Latvia.

16.1.3 Monitoring and verification process

The main data sources for monitoring implemented EE measures comprise data from paid subsidies as well as data from the national Statistics Office (*Latvia Central Statistical Bureau*) and other national databases. Due to the fact that the implemented energy efficiency measures are co-financed by EU Funds or national, there is the obligation for any involved party to provide information regarding the energy consumption of the relevant facility. The submission of the required information is performed according to a 2-step process. In the first step the information for the involved party shall be submitted by each individual implementer of the project to the Responsible Institutions (RI), which has granted or provided any type of financial aid. In the second step the RI examines and compiles the individual reports, thus eliminating the risks of double counting of savings, and submits the reports to the Ministry of Economics. Moreover, voluntary provision of information is foreseen by the Article 9 of the CMR No.923, which states that the involved parties, which are not referred as the RI, shall inform the Ministry of Economics about the energy savings achieved by the energy efficiency projects, utilising specific saving report forms.

The CMR No.923 sets specific guidelines in order to ensure that the provided information in the energy savings reports is reliable and that the energy savings can be checked and evaluated. Specifically, the involved parties should complete specific forms and utilise documented information (heating and electricity accounts, project reports, notifications, energy audit reports, other documents). Currently, the CMR No382 (2013) established a specific auditing procedure with the involvement of almost 100 independent experts in the area of energy efficiency of buildings.

The reporting is performed on annual basis. The Ministry of Economics shall by 1 May each year compiles information regarding the energy savings achieved in the State in each of the end-use sectors (Article 11 of the CMR No.923). There are not specific targets being set for the implementation of the monitored and verified EE measures on annual basis.

16.2 Efficient use of energy resources, reduction of energy consumption and transfer to RES in manufacturing industry – 2014-2020 EU Structural Fund programming period[48]

16.2.1 Short description of the policy measure

The Structural Funds programming period is mentioned in the article 7 notification to EC, but the measure itself is not. The following options are considered within this measure:

- the improvement of energy efficiency of buildings of manufacturing industry enterprises
- energy certification of buildings
- construction works for the increase of energy efficiency – heat insulation of buildings' delimiting (boundary) structures, reconstruction of engineering systems of buildings, installation of recuperation
- energy control and management equipment
- acquisition and installation of new and efficient thermal (heat) energy, electricity producing and water boiler production equipment using RES.

Type of policy measure	Financial
Lifetime of the measure	2014-2020
Target groups	Manufacturing industry enterprises
Target technology	Insulation, heating, energy management and certification etc.
Target energy savings	The impact of the measure may be evaluated as substantial.

Table 40. Main features of the EU Structural programming in Latvia

16.2.2 Energy saving calculation (methods) and data requirements

The following threshold value related to minimum cost efficiency had been applied: 1.59 kWh heat energy savings per 1 EUR co-financed by CCFI. When applying this threshold value for heat energy

[48] Information for this measure is obtained from the official EU notification of Latvia (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the website of MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/LV28.PDF).

saving within the described particular measure, one can calculate at least ~ 50 GWh (0.18 PJ) heat energy savings in year 2023, after full implementation of the measure.

16.2.3 Monitoring and verification process

Annual reporting, ex-ante evaluation.

17 Lithuania

17.1 Energy Efficiency Obligation (EEO) scheme[49]

17.1.1 Short description of the policy measure

The introduction of an EEO in Lithuania has proved to be a major challenge. The *Law of the Republic of Lithuania on energy efficiency* that would lead to the implementation of the EEO, was expected to pass in the Lithuanian Parliament in 2015 but it was delayed due to political uncertainties and large revisions (e.g. unanswered question related to the implementation process and how to cover DSOs` costs.)

Due to the fact that the Law is still in the process of being drafted, and that the first draft was rejected which has resulted in a cautious openness about the final results of the legislative process, there is very limited information available about the expected setup of the EEO in Lithuania.

The policy objectives of the EEO are to improve energy efficiency, and reduce the negative impact on the environment by improving energy efficiency. However, the types of measures that will be used are not yet available.

Although the implementation of the measures is to be promoted in the sectors of the industry and buildings, there are no limitations that prevent the obligated parties from seeking optimal energy savings in other areas as well. The obligated parties can implement energy efficiency improvement measures at all end-users.

Type of policy measure	EEO
Lifetime of the measure	2014-2020 (but not yet adopted)
Target groups	Distribution network operators and heat supply firms
Target technology	Not specified yet
Target energy savings	45.92 ktoe (2014-2016) 183.68 ktoe (2017-2020)

Table 41. Main features of the Lithuanian EEO

[49] Information on the EEO scheme was obtained from the official EC notification of Lithuania (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), multEE deliverable D1.2: Synthesis report on M&V schemes and coordination mechanisms in EU Member States (http://multee.eu/system/files/D.1.2_Mapping%20Synthesis%20report.pdf), and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results).

In the first phase of the EEO Scheme, the obligated parties in Lithuania will be:

- Two electric DSOs, the largest of which is Lesto supplying 44.2% of all electricity.
- One gas company, Lietuvos dujos, distributing 97.3% of the total amount of natural gas.
- District heating companies that sell more than 90 GWh of heat, amounting to ten companies in total.

The main responsibilities of the obligated parties are:

- To ensure that end-users implement energy efficiency enhancement measures;
- To provide the Lithuanian Energy Agency with information on the scope, costs and energy savings associated with the energy efficiency enhancement measures implemented by the obligated party;
- To formulate proposals for the Lithuania Energy Agency to include energy efficiency enhancement measures into a catalogue of standard energy efficiency enhancement measures and achievable savings.

17.1.2 Energy saving calculation (methods) and data requirements

The amount of energy which needs to be saved is calculated in accordance with the Directive and the Commission's recommendations. This amount is established by the Lithuanian Ministry of Energy.

The main data sources for the monitoring of the implemented energy efficiency measures consists of the national statistical office and other national databases. Most of the data are submitted by the institutions, which are the administrators of the energy efficiency measures and the participating authorities in the planning and implementation of energy efficiency measures.

Bottom-up approaches are utilized for the measurement of the achieved energy savings. These approaches are based on the estimation of the reduction of the final energy consumption after the implementation of measures. As already mentioned the required data are collected from the beneficiaries or the administrators of the energy efficiency measures.

Until such time as a new method of calculating and establishing the amount of energy saved is adopted and a new catalogue of standard energy efficiency enhancement measures and achievable savings is compiled, the amount of energy saved will be calculated in accordance with the rules for calculating energy savings achieved at national level, adopted by Order No 1-33 of the Lithuanian Minister for Energy of 10 April 2009, and the rules for monitoring the efficient use of energy and energy sources, adopted by Order No 692 of the Lithuanian Minister for Energy of 9 July 2008.

The Lithuanian Energy Agency is responsible to establish the overall end-use saving targets, operating period and individual obligations as well as the principles of evaluating energy savings.

17.1.3 Monitoring and verification process

Monitoring and verification schemes are not yet implemented in Lithuania. It is planned that the Lithuanian Energy Agency will perform system monitoring and evaluation of functions. The Agency`s responsibilities are to:

- establish a catalogue of standard energy efficiency enhancement measures and achievable savings;
- adopt a methodology which obligated parties must use to calculate savings;
- carry out quality control, savings calculation and monitoring and evaluation functions;
- verify that the obligated parties have implemented the measures at the requisite level of quality;
- gather information about the efficiency measures implemented;
- draw up reports on the results achieved
- establish a procedure for reimbursing the costs incurred by the obligated parties while implementing the obligations imposed on them
- lay down the principles for sanctioning the obligated parties
- impose sanctions on obligated parties that fail to fulfil their obligations.

Audits will be carried out on the basis of the procedure and conditions currently in force for auditing energy efficiency in buildings, equipment and technological processes, the procedure for the training and certification of specialists carrying out audits of energy efficiency in buildings, equipment and technological processes, the comprehensive methodology for auditing the consumption of energy in public buildings and the methodology for auditing energy, energy resource and water use in technological processes and equipment.

18 Luxembourg

18.1 Energy Efficiency Obligation (EEO) scheme[50]

18.1.1 Short description of the policy measure

All suppliers of electricity and natural gas serving residential, service sector and industrial customers shall be declared obligated parties by law. According to the Institut Luxembourgeois de Régulation (Regulatory Agency of Luxembourg) this means 25 suppliers of electricity, and 11 suppliers of natural gas (as of August 2014).

The obligation will only apply to suppliers of electricity and natural gas. The obligated parties will not, however, be limited to achieving energy savings in their own energy sector but will be free to record savings achieved in any other energy sector. Actions are eligible in **all end-use sectors** to save **all types of energy**. The baseline is defined according to given minimum energy performance requirements. Behavioural actions may be eligible under conditions. Energy savings in the transport sector can only be taken into account to a limited extent.

Energy savings projects can also be led by third parties (installers, energy advisors, etc.), but they have to be directly subcontracted by the obligated parties (through call for projects, bilateral contracts or simple negotiations).

The results are counted in 1st-year savings for the achievement of the target, taking into account that the actions have to effectively or fictively deliver energy savings in 2020. So, for measures with a lifetime above and beyond 2020, the whole first year savings can be counted towards target. However, measures with a lifetime prior to 2020 only a part of the first year savings can be counted towards the target after putting in relation the year of implementation of the measure and the 2020 deadline.

Making energy savings will lead to the obligated parties incurring additional costs, part of which could be passed on to the final customers, which may lead to a certain increase in the price of electricity and natural gas. In order to avoid distorting competition between different suppliers and different types of energy, we therefore plan to impose a tax or charge on non-obligated suppliers.

Type of policy measure	Obligation
Lifetime of the measure	2014-2020

[50] Information on the EEO scheme was obtained from the official EC notification of Luxembourg (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results).

Type of policy measure	Obligation
Target groups	Suppliers of electricity and natural gas
Target technology	Various including engines, pumps, ventilation, cooling, heating, pressurized air
Target energy savings	5,994 GWh cumulative (2014-2020)

Table 42. Main features of the EEO scheme in Luxembourg

The overall target has been set to achieve 100% of the target for the EED article 7: **5 993 GWh** of final energy savings cumulated **over 2015-2020**. The individual targets are set annually based on the market share of the obligated parties (cumulative level of about **285 GWh/a** of new energy savings).

18.1.2 Energy saving calculation (methods) and data requirements

A catalogue of 34 standardized measures (including deemed savings) has been prepared. Energy savings generated by an energy efficiency measures listed in the standardized catalogue must be calculated in accordance with the standardized method. For measures not listed in the catalogue of standard measures, Luxembourg established a calculation method to evaluate the estimated energy savings due to the action.

18.1.3 Monitoring and verification process

The parties must draw up an annual account of the savings made in each completed year. This annual report must be compiled by each individual obligated party, and must contain information on the sector, the type of energy, the energy efficiency measure itself, the type of action, the action performed by third parties and also the costs of administration and performance of the action. Standard notification forms have been published on the website of the Ministry of the Economy. Supporting documentation regarding the savings declared must be retained by the obligated parties for at least 10 years and produced in the event of an inspection.

A random annual inspection of a representative sample of the energy efficiency measures will at the request of the Ministry of the Economy be carried out by an independent consultancy hired for that purpose.

19 Malta

19.1 Alternative Measures - Actions leading to energy efficiency and energy savings in Government Owned Industry[51]

Malta's December 2013 Report, proposed a series of measures – Alternative Measures – addressing the various sectors with the aim of achieving the target overall savings of 656 GWh. Some of these measures specifically targeted Industry. These can be divided into two, the public Industry i.e. the Water Services Corporation and Wasteserv Ltd, and the non-public enterprises. The December 2013 report indicated cumulative savings of 182.7 GWh for the Government owned Industries and 9.9 GWh from the schemes for non-public enterprises.

19.1.1 Short description of the policy measure

A series of investments were done by the Government Owned industry of Water Services Corporation (WSC) and Wasteserv with minor contribution also from the European Regional Development Funds, as follows:

The Water Services Corporation is the enterprise in Malta responsible for the supply and distribution of potable water to the Islands as well as the collection and treatment of wastewater. Investments included:

a. Reduction of power requirements in the transfer and distribution of water through various pipelines;
b. Reduction of power requirements through the use of variable speed drives for groundwater abstraction pumps;
c. Upgrading of Reverse Osmosis (RO) high pressure pumps and energy recovery systems;
d. Reduction of power requirements through replacement of RO auxiliary pumps;
e. Replacing desalinated RO water by ground water;
f. Reducing electricity consumption through the elimination of seawater infiltration in the sewage collection;

[51] Information on the EEO scheme was obtained from the official EC notification of Malta (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), multEE deliverable D1.2: Synthesis report on M&V schemes and coordination mechanisms in EU Member States (http://multee.eu/system/files/D.1.2_Mapping%20Synthesis%20report.pdf), and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results).

g. Upgrading the quality of treated sewage effluent to replace desalinated RO water for non-potable uses;

Wasteserv is the enterprise in Malta responsible for organising, managing and operating integrated systems for waste management including integrated systems for minimisation, collection, transport, sorting, re-use utilisation, re-cycling, treatment and disposal of solid and hazardous waste. The investment made by this enterprise was aimed at improving the energy consumption during processing of animal waste at the Civil Abatoir.

Type of policy measure	Investments to improve energy efficiency
Lifetime of the measure	2015-2020
Target groups	Government owned industry
Target technology	Various
Target energy savings	182.7 GWh in 2020 (cumulative)

Table 43. Main features of the Maltese investments to promote EE scheme

19.1.2 Energy saving calculation (methods) and data requirements

At WSC 'metering' methodology, supported by 'scaled savings' to monitor individual equipment will be used to quantify savings. It is standard practice within the WSC to measure and keep records of operational parameters which include water flows from sources down to zone and consumer consumption) measured by means of water meters installed throughout the system, water pressure at pumps and critical nodes, and power consumptions of the various pumps installed throughout the water supply system. The performance of sewage pumping stations and sewage treatment plants is also monitored and recorded.

Data collection (measurement) is carried out mainly automatically through a SCADA system operated from the corporation's central control room. Some data is collected manually through regular site visits by WSC employees. It is also part of the WSC's procedures to conduct energy auditing regularly.

This measurement and data recording systems will be used for monitoring and verification of results.

At Wasteserv 'metering' methodology, through the measurement of the electricity consumption and diesel flow will be used. This will be done using electricity meters, and fuel flowmeters.

19.1.3 Monitoring and verification process

Since, most of the WSC measures are part-funded under the EU's ERDF OP-1, the Managing Authority, will conduct verification audits in 2016 (when funding is wrapped up). SEWCU may participate in this audit. Post 2016, the audit/verification process will be taken over by the Sustainable Energy and Water Conservation Unit (SEWCU). SEWCU will request beneficiaries to submit independent verification of the data and calculation/measurement of the savings. SEWCU

will, directly or through independent consultants, verify the operator's report and may carry out extra inspections post-independent verification. The same procedure will be adopted to monitor and verify actions taken by Wasteserv.

19.2 Alternative measures schemes intended for giving financial incentives on specific technologies to all enterprises, including industry

19.2.1 Short description of the policy measure

Schemes offering financial incentives are being planned to promote the installation of technologies that lead to further energy efficiency in Industry. The main objective of this measure is to effect a change in mentality in favour of intelligent energy use in the sector.

The December 2013 Article 7 submission includes the following measures:

(i) Subsidising heat pumps for heating water in commercial premises so as to incentivise their use in those premises where solar water heater cannot be installed, such as due to lack of airspace (access to suitable and sufficient solar radiation) or high rate of water usage. Through this scheme, a number of commercial operators (300) will be offered a financial incentive towards the capital cost of this device.

(ii) A tax rebate is proposed to incentivise this sector to introduce modern efficient equipment that could be operated intelligently for space cooling and heating in the cold months where appropriate (AC).

A tax credit scheme will support the substitution of present light fittings with ones which consume less energy. The switch to more efficient light fittings will have several advantages, including longer life time and short payback period (2 to 3 years) while the consumption of energy will be reduced by half. Furthermore, with the new type and modern luminaries the power factor shall be improved and hence the losses shall continue to decrease.

Type of policy measure	Financing Schemes and fiscal incentives
Lifetime of the measure	2015-2020
Target groups	Industry
Target technology	Various
Target energy savings	9.9 GWh in 2020 (cumulative)

Table 44. Main features of the Maltese scheme for financing enterprises

19.2.2 Energy saving calculation (methods) and data requirements

Depending on the extent of the energy investment the Beneficiary will have to submit a Report which includes details on the specifications of the installation. The Report will have to include 'deemed' or 'scaled' savings.

19.2.3 Monitoring and verification process

External consultants to the Beneficiaries will conduct the overall verification of the annual energy savings which Report will be forwarded to the entity running the scheme. The financial incentive will be subject to the Beneficiary submission of the energy savings Report.

20 Netherlands[52]

Since 1992, the Dutch government has long-term agreements with a wide range of sectors with the clear goal to improve energy efficiency by stimulating more economical and rational decision-making on energy-saving techniques and increasing knowledge of the triggered benefits by the increase of energy efficiency. There are currently two types of long-term agreements, the MJA3 and MEE covenants.[53] The first generation of MJA covenants ended in 2000 and was followed by MJA2 (2001-2012) and the Benchmarking covenant (2001-2012). In 2008, the government decided to extend and widen the scope of the MJA3 covenant, resulting in the current MJA3 covenant (2001-2020) applicable for non-ETS businesses. In the same time, the Benchmarking covenant has been converted to the current MEE-covenant (2001-2020) intended for ETS covered businesses.

Besides long-term agreements, two fiscal measures (the Green Fund scheme and the Energy Investment Allowance) will be discussed in details below.

20.1 Long-term voluntary agreements on energy efficiency with non-ETS businesses (LTA3)

20.1.1 Short description of the measure

As it was mentioned above, the LTA agreements between the Dutch government and a large amount of businesses have been established already in 2001. The currently running third phase of these agreements, the LTA3, is the agreement between the government and non-ETS sectors. The ministries involved in this covenant are the Ministry of the Interior and Kingdom Relations, Economic Affairs, Infrastructure and the Environment as well as the Ministry of Finance and the Association of Provincial Authorities (IPO).

Type of policy measure	Cooperative measure
Lifetime of the measure	2001-2020 (third phase from 2012)
Target groups	Non-ETS sectors
Target technology	A broad range of technologies and practices related to

[52] Information on the Dutch measures was obtained from the official EC notification of Netherlands (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), the website of the Netherlands Enterprise Agency (http://english.rvo.nl/) and the D3.1 report of the ENSPOL project (http://enspol.eu/results)

[53] http://www.rvo.nl/subsidies-regelingen/meerjarenafspraken-energie-efficiency/over-de-convenanten

Type of policy measure	Cooperative measure
	process-efficiency, production pathway (supply chain) efficiency, product chain efficiency, production and purchase of renewable energy.
Target energy savings	1 PJ (cumulative) and 45% energy efficiency improvement in the period of 1998 and 2020

Table 45. Main features of the Dutch LTA3

20.1.2 Energy saving calculation (methods) and data requirements

For process related measures the savings are the sum of the annual primary energy savings during the start of the new planning period (historical consumption is used as reference). For up- and downstream (keten) measures the N-1 year is taken as a baseline. For most MJA sectors monitoring reports are provided which show the primary energy consumption of the previous year (split up in different energy sources), and the primary energy consumption of the reporting year. The difference (in most cases a reduction) is allocated to the various measures that the sector companies have taken. For the glass industry the 2013 sector report allocates energy savings to 1) reduced production volume, 2) process efficiency measures (e.g. oven revisions, optimisation of pre-oven/feeder, improvements of energy monitoring, switch high to low pressure compressed air), 3) supply chain efficiency measures (e.g. extra use of recycled glass, substituting synthetic soda with natural soda).

The calculations on energy savings and energy efficiency in LTA3 are, both for plans as for the monitoring, based on the final energy consumption in 2020 with respect to the reference projection 2012 of ECN/PBL, as follows:

- Energy savings per year, not cumulative (PE and CE)
- Savings in terms of primary energy (PE and CE)
- Excluding the purchase of renewable energy (SE)
- Excluding the production of renewable energy within the premises of the industry (SE)
- Including autonomous energy efficiency improvement (PE and CE)
- Including the results of EU-policies (PE and CE).

The following data need to be provided:

- energy use
- energy saving measure for the production process and chain (both national and international) and the amount of renewable energy used.

The following aspects also need to be taken into account:

- factors that influence the production process
- volume changes in the production process.

The reference year is 2005 therefore measures implemented after this year count only as energy efficiency measures.

The methodology of data gathering can be found in the `MJA3 Covenant Methodiek energie-efficiency` on the RVO website.[54]

20.1.3 Monitoring and verification process

Participants are required to send their monitoring data annually (before 1 of April) to RVO and their own branch organization. Based on the monitoring data, RVO prepares a report stating whether the company has achieved its energy objectives regarding:

(a) the implementation of Systematic Energy Management
(b) the implementation of the Energy Efficiency Plans;
(c) the implementation of the Long-Term Plan;
(d) the Energy Efficiency Improvement achieved as a result of a, b and c;
(e) the CO_2 emissions avoided as a result of a, b, and c;
(f) the progress and implementation of Roadmaps and Preliminary Studies;
(g) the Enterprises that have taken part in the monitoring program, the timeliness and the quality of the monitoring.

A company participating in the program undertakes to do the following: Draw up an energy saving plan every four years in consultation with the Competent Authority. In the Energy Efficiency Plan (EEP) the company describes the cost-effective measures taken within its own process and within the chain. As far as possible, a list of measures is drawn up for each participating LTA industry. Companies carry out the cost-effective energy-efficiency measures from the list. A trade objective is established on the basis of all EEPs in an industry. This is laid down in a Long-Term Plan (LTP). Within three years of joining an LTA3 program, the company must have an energy management system.

A new methodology for monitoring the LTA3 results was established in February 2010. The core element of the new methodology is that the result will be solely based on the implementation of measures. The LTA3 results can be subdivided into measures in the area of process efficiency (PE), chain efficiency (CE) and the generation and purchase of sustainable energy (SE). The mandatory reporting is integrated in the electronic environmental report (in Dutch milieujaarverslag, e-MJV) which is a secured, shielded system where companies can upload their numerical reports.

More details of the monitoring can be found in the `MJA3 Covenant Protocolmonitoring, methodiek` on the RVO website.[55]

[54] https://www.rvo.nl/sites/default/files/2014/06/Methodiek%20energie%20efficiency%20MJA3.pdf

[55] http://www.rvo.nl/subsidies-regelingen/monitoring-mja3-convenant

20.2 Long-term voluntary agreements on energy efficiency with ETS-covered businesses (MEE)

20.2.1 Short description of the measure

The long-term agreements on energy efficiency with ETS-covered sectors (MEE) were launched in 2012 and it is the follow-up of the Benchmarking covenant that has started in 2001. The ministries involved in this covenant are the Ministry of Economic Affairs, Ministry of Infrastructure and the Environment and the Ministry of Finance.

Type of policy measure	Cooperative measure
Lifetime of the measure	2001-2020 (called MEE since 2012)
Target groups	Fully or partly ETS-covered sectors
Target technology	All measures resulting in primary energy savings
Target energy savings	2 PJ (cumulative) and 30% energy efficiency improvement in the period of 2005 and 2020 with more focus on supply chain efficiency and cross-sector collaborations

Table 46. Main features of the Dutch MEE

20.2.2 Energy saving calculation (methods) and data requirements

All energy consumption will be converted into primary energy, based on LHV of energy. Electricity will be accounted for with 42% conversion efficiency. For process related measures the savings are the sum of the annual savings during the start of the new planning period (historical consumption is used as reference). For up- and downstream (keten) measures the N-1 year is taken as a baseline. There is a comprehensive software tool (EVA) to aid stakeholders to calculate and present their energy balance in matrix form, which includes all energy flows, and all relevant energy functions.

The calculations on energy savings and energy efficiency in LTA3 are, both for plans as for the monitoring, based on the final energy consumption in 2020 with respect to the reference projection 2012 of ECN/PBL, as follows:

- Energy savings per year, not cumulative (PE and CE)
- Savings in terms of primary energy (PE and CE)
- Excluding the purchase of renewable energy (SE)
- Excluding the production of renewable energy within the premises of the industry (SE)
- Including autonomous energy efficiency improvement (PE and CE)
- Including the results of EU-policies (PE and CE).

Guidance on calculation (including examples) can be found in the `Handreiking monitoring MEE-covenant` version 4.3 on the RVO website.[56] The following data need to be provided:

- energy use
- energy saving measure for the production process and chain (both national and international) and the amount of renewable energy used.

The following aspects also need to be taken into account:

- factors that influence the production process
- volume changes in the production process.

The reference year is 2006 therefore measures implemented after this year count only as energy efficiency measures.

The methodology of data gathering can be found in the `MEE Covenant Methodiek energie-efficiency` on the RVO website.[57]

20.2.3 Monitoring and verification process

Participants are required to send their monitoring data annually (before 1 of April) to RVO and their own branch organization. Based on the monitoring data, RVO prepares a report stating whether the company has achieved its energy objectives regarding:

(a) the implementation of the Energy Efficiency Plans;
(b) the implementation of the Long-term Plan (if any);
(c) the energy efficiency improvement achieved and the CO2 emissions avoided as a result of a and b;
(d) preliminary studies and roadmaps.

A company participating in the program undertakes to do the following: Draw up an energy saving plan every four years in consultation with the Competent Authority. In the Energy Efficiency Plan (EEP) the company describes the cost-effective measures taken within its own process and within the chain. As far as possible, a list of measures is drawn up for each participating LTA industry. Companies carry out the cost-effective energy-efficiency measures from the list. A trade objective is established on the basis of all EEPs in an industry. This is laid down in a Long-Term Plan (LTP). Within three years of joining an LTA3 program, the company must have an energy management system.

A new methodology for monitoring the LTA3 results was established in February 2010. The core element of the new methodology is that the result will be solely based on the implementation of

[56] http://www.rvo.nl/sites/default/files/2015/01/Handreiking%20monitoring%20MEE%20versie%204.3%20-%20december%202015.pdf

[57] http://www.rvo.nl/sites/default/files/2014/04/Methodiek%20energie%20efficiency%20MEE.pdf

measures. The LTA3 results can be subdivided into measures in the area of process efficiency (PE), chain efficiency (CE) and the generation and purchase of sustainable energy (SE).

More details of the monitoring can be found in the `MEE Covenant Protocolmonitoring, methodiek` on the RVO website.[58]

20.3 Green Funds scheme (MIA/VAMIL)

20.3.1 Short description of the measure

There are currently two fiscal measures within the framework of Green Funds to simulate investments in energy efficiency measures. The MIA scheme (Environmental Investment Deduction, in Dutch: Milieu-investeringsaftrek; introduced in 2000) offers businesses that invest in environmentally-friendly equipment the opportunity to deduct 36% of the investment costs from their taxable profits.

The VAMIL scheme (Arbitrary Depreciation of Environmental Investments, in Dutch: Vrije Afschrijving Milieu-investeringen; developed in 1991) allows to depreciate the investment costs on any given moment. MIA allows the investor to additionally deduct up to 40% of the investment costs for a particular technology from the fiscal profit, resulting in lower taxes for the investor.

Type of policy measure	Fiscal/tariffs
Lifetime of the measure	1995 - ongoing
Target groups	Crosscutting
Target technology	Broad range of eligible investments (see Environmental List)
Target energy savings	Not specified

Table 47. Main features of the Dutch Green Funds scheme

All Dutch entrepreneurs paying income or corporate tax are eligible to apply for the MIA/VAMIL schemes. They are particularly interesting for entrepreneurs in the agricultural sector, shipping and industry, but also for entrepreneurs investing in sustainable transport and sustainable buildings. The broad range of eligible investments (more than 300) can be found on the Environmental List (in Dutch: Milieulijst)[59] that is updated every year.

Businesses (suppliers and entrepreneurs) can propose that a particular capital asset should be included on the list. To be eligible the environmental investment must at least:

[58] http://www.rvo.nl/sites/default/files/2014/04/Monitoring%20Protocol%2C%20methodiek%20MEE.pdf

[59] https://www.rvo.nl/sites/default/files/Brochure%26Milieulijst%202016.pdf

- provide an obvious environmental benefit
- be innovative or must still have a small market share in relation to the alternative
- be more expensive than the environmentally unfriendly alternative.

20.3.2 Energy saving calculation (methods) and data requirements

Project plans asking for 'green funding' have to meet specific requirements, but are not reporting on energy savings in quantitative terms. In buildings refurbishments a minimum improvement of 4 energy label steps is required. For investments in micro-CHP equipment and space heating (heat pumps) no energy savings information is requested. For public lighting and heat grid operators some quantitative savings estimate needs to be provided in the project plan.

In 2016, the available budget is 97 million euros for MIA and 40 million euros for VAMIL. When the budget is exhausted, it is still possible to apply and use the budget from the following year. On the contrary, if some of the budget is unused, it can be transferred to the next year.

Applications for the MIA and VAMIL schemes are straightforward and entirely digital via eLoket (webportal of RVO).

No statement from an accountant is needed for a MIA and/or Vamil scheme application, however, the investment needs to be reported to RVO within three months of the date of the investment.

20.3.3 Monitoring and verification process

MIA and VAMIL are regulated by the Ministry of Finance and the Ministry of Infrastructure and Environment while RVO (Netherlands Enterprise Agency) and the Tax Office (Belastingdienst) are responsible for their implementation. RVO also supports the development of the Environmental List and executes technical controls to verify the applications. The Tax Office controls the tax returns and determines the eligibility for MIA/VAMIL.

20.4 Energy investment allowance (EIA)

20.4.1 Short description of the measure

With the EIA scheme companies are allowed to deduct 58% (a net benefit of approximately 14%) of the eligible investment costs from their fiscal profit (on top of the usual fiscal write down). As a result less income or corporate taxes have to be paid.

All Dutch entrepreneurs paying income or corporate tax are eligible to apply for the EIA if the investment in energy saving measures exceeds the minimum of 2500 euros but not larger than 120

million euros per year. There is a so-called Energy List (in Dutch: Energielijst)[60] that contains the detailed list of all eligible investments / measures. The list is updated every year.

Both EIA and MIA cannot be used for the same investment element, although it is possible to combine the EIA and MIA with VAMIL. The budget for 2016 is set at € 161 million.

Type of policy measure	Fiscal/tariffs
Lifetime of the measure	1997 - ongoing
Target groups	Crosscutting
Target technology	Broad range of eligible investments (see Energy list)
Target energy savings	15 PJ (cumulative between 2014 and 2020)

Table 48. Main features of the Dutch EIA

20.4.2 Energy saving calculation (methods) and data requirements

Benchmarking is done based on the assumption of old technologies / practices being replaced. For replacement of a capital good (bedrijfsmiddel) the historical energy use is used as a reference. With a new building or expansion the average (default) energy use of equivalent technologies used in that branch as reference. The latter results in a certain weighted average (default) Energy Savings coefficient resulting in an energy savings (expressed in natural gas equivalents; default conversion factors are used). Investments must also meet certain norm savings expressed in savings per EUR invested in order to be eligible for the EIA. The norm for buildings for instance is 0.2 to 1.0 Nm^3 savings per EUR invested, and for cars it is 0.2 – 0.8 Nm^3 saved per EUR invested. The guidance does not seem to be very clear on which reference period should be applied (could be one year period before investment, or any other time unit).

Similarly to MIA and VAMIL, applications for EIA can be executed within three months of the date of the investment on a simple manner using the eLoket site of RVO. Before application, the applicant also needs to acquire an `eHerkenning` that verifies the trustability of the applicant.

Some of the investments require the issuing of permits e.g. environmental permits that may be asked by RVO throughout the application process.

20.4.3 Monitoring and verification process

EIA is regulated by the Ministry of Finance and Economic Affairs while RVO and the Tax Office are responsible for its implementation. RVO also supports the development of the Energy List and executes verifies the applications. The Tax Office controls the tax returns and determines the eligibility for EIA.

[60] https://www.rvo.nl/sites/default/files/Energie%20Investeringsaftrek%20-%20Energielijst%202016.pdf

21 Norway

Since Norway is not a Member State of the European Union, the Energy Efficiency Directive (EED) does not directly apply. Nevertheless, Norway is involved in the Concerted Action on the EED, as a forum for exchange of knowledge and experiences. There are no requirements for Norway for verified energy savings. Norway has implemented a variety of policies ('alternative measures'), also in the industrial sector.

21.1 Industrial energy efficiency network (IEEN)[61]

21.1.1 Short description of the measure

The Norwegian Industrial Energy Efficiency Network (IEEN) is an industry guided energy efficiency programme financed by Norwegian Water Resources and Energy Directorate (NVE), and membership is free to companies. The members are distributed among many different industry sectors. In some sectors virtually all companies are members, and all industrial companies are entitled to become members irrespective of the industry sector in which they operate.

Type of policy measure	Financial, information/education/training
Lifetime of the measure	Since 1989
Target groups	All industrial sectors
Target technology	Not applicable
Target energy savings	The IEEN's members saved at least 700 GWh over the period 1995-2000

Table 49. Main features of the Norwegian industrial energy efficiency network

21.1.2 Energy saving calculation (methods) and data requirements

One method of calculating energy savings is by multiplying quantity produced by the change in specific energy use. If we compare specific energy use in 1995 and 2000 and multiply this by the quantity produced in 2000, the saving is approx. 700 GWh (same companies in both years). Over the same period the companies have also increased their use of bioenergy by 1,100 GWh. In total, this provides an environmental saving of 500,000 tonnes CO_2.

[61] Information on the Norwegian IEEN has been obtained from the MURE database (www.measures-odyssee-mure.eu/public/mure_pdf/industry/NOR11.PDF).

The IEEN's Analysis Support Scheme is a service available to all Norwegian industrial companies, which need help in surveying energy efficiency measures of economic benefit to the company. The Analysis Support Scheme offers government grants for the implementation of Phase 1 – energy management, energy-monitoring equipment (EOS) and Phase 2 – energy audit. The grant framework is as follows:

- NOK 27,500 (€ 3,400) with own contribution of NOK 2,500 (€ 340) for Phase 1
- NOK 100,000 (€ 12,000) for EOS with 50 % own contribution
- NOK 200,000 (€ 24,000) for Phase 2 with 50 % own contribution

The companies that get help of the analysis support scheme report their 'goal for energy savings' after finished analysis phase 1. Since the start in 1996 over 500 companies have been supported in the beginning of 2002, and out of these approximately 80% has finished the audit. The "goal for energy savings" for the finished analysis is summarized to a total of 820 GWh/year and including an estimation of the unfinished analysis, a total of 1000 GWh/year may be calculated.

In phase 2, which is an energy audit, energy efficiency measures are described and the company sets up a schedule for those measures they intend to carry through. In phase 2, the total of planned measures by Jan. 2002 are 320 GWh/year, of which 160 GWh are estimated.

21.1.3 Monitoring and verification process

IEEN is an industry guided energy efficiency programme financed by Norwegian Water Resources and Energy Directorate (NVE). Institute for energy technology (IFE) is the secretariat for the IEEN. Members of the IEEN report energy use and production directly to IFE or via their sector organisation at the start of each year. The figures reported for energy use and production are used to calculate specific energy use, i.e. energy use divided by quantity produced in tons or similar.

21.2 Support to energy measures in industry[62]

21.2.1 Short description of the measure

Through this programme, Enova supports industrial companies in Norway to implement commercially available technologies, with a potential of energy results equivalent to 100,000 kWh or more. The grant has to be a triggering factor for the investments, which would otherwise not have been implemented. The project must be related to one or several of these areas:

[62] Information on the support to energy measures in industry in Norway has been obtained from the MURE database (www.measures-odyssee-mure.eu/public/mure_pdf/industry/NOR15.PDF).

- Energy efficiency: contribution to reduced energy use per produced unit
- Utilization of surplus energy: recycling of heat or cold to own use or third party use, or eventually for electricity production
- Conversion from fossil sources or electricity to renewable sources

Type of policy measure	Financial
Lifetime of the measure	Since 2003
Target groups	Industrial companies
Target technology	Energy efficiency and renewable energy technologies
Target energy savings	?

Table 50. Main features of the support to energy measures in industry in Norway

21.2.2 Energy saving calculation (methods) and data requirements

No information available.

21.2.3 Monitoring and verification process

The companies have to report energy consumption and production figures to Enova at least five years after the project is finished. As a part of the program, Enova gathers energy consumption and production figures in a database. The companies have to report yearly their figures on a web-based reporting scheme. Enova calculates specific energy consumption for different industry sectors and presents the anonymous data on the internet.

21.3 Support to the introduction of energy management in industry and equipment[63]

21.3.1 Short description of the measure

This programme aims at supporting analysis for industries and equipment producers, to identify measures to be taken, and establish energy management. Projects which may qualify for support include:

[63] Information on the support to the introduction of energy management in industry and equipment in Norway has been obtained from the MURE database (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/NOR19.PDF).

- Mapping, studies and analyses, including measurement equipment and tools which are required for the systematic account of the company's energy use the establishment of measures lists.
- Projects in companies with an energy use of 1 GWh or more per year.
- Projects which are approved by the company's management.
- Projects which have a contract goal corresponding to at least 10% of a specific energy use.

The programme does not support investments in measures themselves. The programme in the previous section is aimed at such support. The maximum funding is of 50% of approved extra costs for the project. The only costs that can be funded are specified extra costs which are required to achieve the energy or climate result from the installation. These costs can be:

- Costs of project and planning.
- Project management costs.
- Purchase of equipment.
- Building of installations and equipment.
- Documentation of energy results.

Type of policy measure	Financial
Lifetime of the measure	Since 2012
Target groups	Production companies
Target technology	Energy efficiency technologies
Target energy savings	?

Table 51. Main features of the support to the introduction of energy management in industry and equipment in Norway

21.3.2 Energy saving calculation (methods) and data requirements

No information available.

21.3.3 Monitoring and verification process

The programme aims at supporting investments in physical installations for demonstration. The projects shall have a defined goal for innovation, for example, in form of reduced costs, increased efficiency, use of new energy sources, reduced specific energy use (energy use per produced unit), reduced emissions of greenhouse gases, etc. The innovation goal shall be documented and must include a real improvement in relation to the established standard. The project must have a defined budget and a clear plan for implementation and financing. The project may involve suppliers and cooperation between several partners. Funding can be provided to the demonstration of technology that has not been introduced before in commercial scale in relation to production processes in Norway, including technology which previously has only been demonstrated in small-scale. In addition, the projects shall have a defined innovation goal, as well as a defined energy and/or climate

goal related to the installation applying. The installation shall be placed in a production company in Norway and have a lifetime of minimum 2 years.

Required concessions and emissions allowances must be available before funding is attributed.

22 Poland

22.1 White Certificate Scheme (WCS)[64]

22.1.1 Short description of the measure

The white certificate scheme (WCS), the Polish energy efficiency obligation scheme which fulfils the requirements of art. 7 of the EED, has two distinctly different periods. The first one was introduced in 2011 as a key element of the first Polish Energy Efficiency Act (EEA2011). Then in the WCS was completely revised by the new EEA adopted in 2016 (EEA2016). Their main goals of both of the systems were the same - to stimulate energy efficiency actions in the end-user sector, increase energy savings in energy production, and reduce losses in the energy distribution and transmission sectors.

In the first period (2012-2016) white certificates (WC) referred to primary energy savings and could be granted for both planned and finished energy efficiency initiatives (measures). The so called "soft" measures, e.g. trainings, public campaigns, were not eligible. Certificates were awarded through public tenders organised at least once a year by the President of Energy Regulation Office (ERO). They were issued by the ERO which played the crucial role in the WCS being also in charge of verification the energy savings claimed by market actors as a result of implementing energy saving measures. WCs were tradable on the commodity exchange (Power Exchange). In case of planned initiatives, the respective WCs could only be traded after the investment has been completed.

WC were provided for three earmarked in auctions categories - end-use energy efficiency (80% of the total quota); energy savings in auxiliary equipment in power plants (10%); energy loss reduction in electricity and natural gas transmission and distribution systems, and heat losses in district heating networks (10%).

There was a complex system of selecting the winners in the tenders which rewarded only these participants who demanded the lowest prices for their energy savings.

Under the obligation scheme energy suppliers selling electric energy, natural gas and heat were obliged to obtain a specified number of WCs (valued in toe), and then present them to the ERO for redemption. In 2012-2016, the required amount was equal to the ratio of 1.5% (in 2013 it was 1%) of the income of the obliged party in the previous year to the value of the so called "substitution fee" which was set to 1 000 PLN for one toe. The system covered all possible channels (gates) of delivering energy to the end users, i.e. bilateral over the counter transactions and energy trading on

[64] Information on the Polish WCS scheme was obtained from the official EC notification of Poland (https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_poland.pdf) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results)

the commodity exchange. The obliged parties who failed to submit WCs for redemption or pay the substitution fees were subjects to severe financial penalties imposed by the ERO.

The legal obligations could also be met by paying substitution fees proportional to the number of missing certificates. The substitution fees then were directly allocated to the National Fund of Environmental and Water Protection (NFEWP) and could be used among others for funding energy efficiency oriented projects.

The Polish WCS, as given by the EEA2011, had originally been designed as the main measure to reach the indicative energy saving cumulative target of 9% in 2016 as desired by the ESD. The cumulative energy saving, target for Poland for 2007-2016 had been set at 4.59 Mtoe (53.4 TWh) of final energy of which 2.2 Mtoe (25.6 TWh) should have been saved by the WCS.

The auctioning system turned out to be complicated, unclear, administratively costly and therefore commonly criticized. Additionally the WCS insufficiently contributed to development of energy services market, e.g. ESCO, energy audits.

Therefore the scheme was updated after the first phase (2012-2016) with plans to be executed in the period of 2017-2020. A fundamental change in the WCS has been the drop of the auctioning process. From the beginning of 2017, WCs are only to be used as a proof of implemented energy saving measures and will be issued “automatically” by the ERO at the request of the implementing company. WCs will be granted only in two cases - for investments finished after the 1st January 2014 or planned energy efficiency investments. The amount of obligation is now directly expressed in energy units (toe) as 1.5% of energy, i.e. electrical energy, natural gas or heat, sold to the end-users. Natural gas used for non-energy purposes, e.g. in chemical industry, is excluded from the obligation. The value of WC is determined in final energy instead of primary energy as previously. The EU ETS installations are covered by the scheme.

It will still be required to make a declaration of the amount of the planned energy savings, describe the type of the investment and declare duration of the savings period. Obligated parties are also required to develop an energy audit to prove the declared savings. In addition, in long term perspective it will be no longer possible to pay substitution fees to comply with the obligation. The EEA2016 includes provisions which gradually will phase out the possibility to pay the substitution fee instead of carrying out the energy efficiency measures. Eligibility of paying substitution fee will be steadily limited, i.e. 30% in 2016; 20% in 2017; 10% in 2018. Possibility to meet the obligation by paying a substitution fee has been limited only to situation when there are not enough WCs in the market. Substitution fee will be increased by 50% in 2017 as compared to the present value, and then by 5% annually.

The target has slightly been revised by the EEA2016, it is explicitly stated that obligatory energy saving forced by the WCS should amount to at least 2.645 Mtoe till 2020 (art. 18 EEA2016). The value results from the objective to save 1.5% final energy annually until 2020, i.e. a total of 10.5%, in accordance with Art. 7(1) of the EED.

Type of policy measure	Obligation, crosscutting
Lifetime of the measure	2012-2016 and 2017-2020

Type of policy measure	Obligation, crosscutting
Target groups	EEO covers a broad range of sectors including the residential, commercial, and industrial sectors (electricity, natural gas, and heat delivered by district heating networks)
Target technology	Wide range of eligible energy saving measures published by the Minister of Energy in the Official Polish Gazette
Target energy savings	2 645 Mtoe between 2016-2020

Table 52. Main features of the Polish White Certificate Scheme

22.1.2 Energy saving calculation (methods) and data requirements

Energy efficiency audits should be used to determine the basic parameters, technical and economic, of any project aiming at improving energy efficiency undertaken in the WCS, such as the annual average primary energy savings (required by the EEA2011) and annual average final energy savings (required by the EEA2016).

The Polish WCS in its 2011 form opened market for energy audits since it required that each energy saving measure submitted for WC tender shall have its energy efficiency audit attached - for simple actions – obtained in a simplified audit procedure; for more complex cases – obtained in a balance audit (full audit of the energy savings balance).

Thus two types of energy efficiency audits are prescribed by the law, namely simplified (deem) audits and balance audits.

The audit methodologies used in the deemed audits shall enable to determine sufficiently precisely the value of energy savings provided certain requirements are fulfilled. Therefore this method is applicable to standard, typical energy efficiency improvement measures. This approach largely simplifies the procedure and reduces costs of energy savings prediction or verification. Deem audits may only be developed for improvements listed in a regulation issued by the Ministry of Energy ((MoE), previously, before early 2016, by the Ministry of Economy), e.g. for walls, roofs, windows, simple lighting systems, home appliances, IT equipment, electric motors up to 100 kW.

It is always eligible to carry out an assessment of savings using the balance audit procedure. It may be more favourable to beneficiaries of the WCS than the simplified audit, since it is more accurate, and it also reveals the actual energy consumption. Its disadvantage is of course the higher cost that in practice may be considered as a market barrier especially for small enterprises. Balance audits are only described in a very general way in the regulation of the MoE, except for buildings and lighting systems for which detailed methodologies are provided. The accompanied general guidance on energy auditing is based on recommendations published by the EC on bottom-up approach laid down in the ESD Annex IV “General framework for measurement and verification of energy savings”. In the balance audit it is possible to use of technical evaluation methods, modelling or to measure energy

consumption before and after the completion of the investment. The savings are then evaluated as a difference of the annual energy consumption before and after investment.

In both methods there are no prescribed methodologies for determining the baselines for energy saving calculations, leaving the difficult and controversial issue to the energy auditors.

Article 8 of the EED addresses energy audits and energy management systems. These audits should be performed by in-house experts or qualified personnel. This requirement has been introduced into the EEA2016. MS are encouraged to promote cost-effective energy audits to all final customers (art. 8, para 1 of the EED). However enterprises not being SMEs shall carry out energy audits on regular bases at least once in four years. The obligation due by 5 December 2015 was implemented in Poland with a small delay in May 2016 by the EEA2016 (art. 36). Enterprises having standardized energy or environmental management systems, e.g. EMAS or ISO 50001, are exempted from this obligation.

The detailed rules and methodology for different types of energy audits are specified in decrees and regulations issued by the Ministry of Economy, now replaced by the Ministry of Energy. These are in principle firmly based on the ESD Annex IV "General framework for measurement and verification of energy savings" and accompanied documents issued by the European Commission. General rules and guidance laid down in "International Performance Measurement and Verification Protocol" are also widely used.

22.1.3 Monitoring and verification process

The energy saving verification procedures differ in the two periods of WCS operation. In the first one (2012-2016) they were more stringent while in the second one (2017-2020) the verification procedures are not so demanding being only limited to investments selected on random bases.

The EEA2011 stated that the company who received the WCs was obliged to accomplish the investment, and then to make an energy audit to prove in reality the declared savings. If the declared energy savings were lower than 100 toe per year, an audit was not required - such small savings were verified on random bases. All investments with energy savings that exceed 100 toe shall ex-post be verified by an energy audit. The audit must not be conducted by the same auditor who carried out the initial audit for the project auction declaration, i.e. for the purpose of the WC auction.

In the new EEA2016 it is only required to submit an energy audit upon making the request to the ERO for WCs granting. The verification system has largely been simplified as the obtained savings are verified on random bases only (art. 26 of the EEA2016).

The whole verification and monitoring process was attributed to the ERO. It may carry out audits with its own staff or by an external company selected in the process of public procurement.

The ERO runs now the national database of WCS audits which is the main data source for monitoring implemented energy efficiency measures in the three different categories used in the public

tenders.[65] Being publicly available it provides only very much incomplete data so that its usefulness is very much limited.

It is worth noting how the data from the energy audits which accompanied the requests for granting WCs will be used under the new EEA2016. These parameters are recorded on the energy efficiency audit card. The ERO is obliged to pass limited data to the MoE. Therefore it extracts only specific data on energy savings from the audit cards and then aggregates it. In this way some data is lost or at least unavailable to the public. The MoE who receives only the aggregated data uses it for statistical purposes, including the needed for reporting obligation to the EC, e.g. imposed by the EED.

[65] http://bip.ure.gov.pl/bip/efektywnosc-energetyczn/swiadectwa-efektywnosci/2885,Zagregowane-dane-dotyczace-wydanych-swiadectw-efektywnosci-energetycznej-2015-r.html

23 Portugal

23.1 Energy efficiency system for industry and other sectors[66]

23.1.1 Short description of the measure

Measures in the industrial sector continue to focus on the implementation of the Intensive Energy Consumption Management System (SGCIE),[67] namely on the potential for energy savings, resulting from obligatory energy audits. These measures can be categorized in the following manner:

a) Measure Ip1m1 - SGCIE – Transversal Measures

b) Measure Ip1m2 - SGCIE – Specific Measures

c) Measure Ip1m3 - SGCIE – Other Sectors

Type of policy measure	Fiscal/tariffs, information/education/training/legislative/informative
Lifetime of the measure	2013 - 2020
Target groups	Industry
Target technology	Electric engines, production of heat and cold, lighting and other measures to promote energy efficiency in industrial processes
Target energy savings	11500 toe annually for each measure and 414000 toe cumulative in 2020

Table 53. Main features of the Portuguese Energy efficiency system

[66] Information on the Energy efficiency system was obtained from the official EC notification of Portugal (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), the multEE deliverable D1.2: Synthesis report on M&V schemes and coordination mechanisms in EU Member States (http://multee.eu/system/files/D.1.2_Mapping%20Synthesis%20report.pdf) and the website of MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/POR4.PDF)

[67] Intensive Energy Consumption Management System - Decree-Law Nº 71/2008, of 15 April 2008 is the predecessor of the Energy efficiency system. It applies to all companies and facilities that have an annual consumption over 500 toe/year, imposing binding energy audits, with a 6-year periodicity, in energy intensive facilities with consumption above 1000 toe/year, and an 8-year periodicity for energy audits to facilities with energy consumption between 500 and 1000 toe/year.

Transversal measures target electric engines (e.g. optimizing engines, pump systems, ventilation systems and compression systems), production of heat and cold (e.g. cogeneration, combustion systems, heat recovery and industrial cooling), lighting and other industrial processes (e.g. monitoring and control, treatment of effluents, process integration, maintaining energy consuming equipment, thermal insulation, training and awareness for human resources and reduction of reactive energy).

A set of specific or sectoral measures were identified for a group of industrial sectors including food & beverages, ceramics, cement, timber, metal, paper, chemicals, iron textile, glass and garments sectors. The list of specific measures/technologies can be found in the official EC notification of Portugal.

The measure for other sectors identifies the existing potential for savings in the SGCIE, in addition to those mentioned in Measure Ip1m2, as well as the potential resulting from new cogeneration projects or other actions which are not directly linked to the implementation of the SGCIE, but which lead to an increase in energy efficiency in the industrial sector.

23.1.2 Energy saving calculation (methods) and data requirements

There are two types of calculating methods (according to Directive 2006/32/EC)):

- top-down where the energy saving is estimated by means of national or aggregate sectoral data, based on a reference year and
- bottom-up where the energy saving is calculated by adding together estimates of the impact of each measure.

Depending on the measure, the following variables need to be considered in units of toe:

- energy saving for electric engines
- energy saving while producing heat and cold
- energy saving for lighting and
- energy saving due to efficiency of industrial and other processes.

The data are collected by the Ministry, which is responsible for energy efficiency policy with the support from the Energy Agency (ADENE). Facilities operators are obliged to conduct an energy audit and elaborate an Energy Consumption Rationalization Plan (PREn) establishing targets for energy and carbon intensity and specific energy consumption and including the energy rationalization measures. Moreover, they have to present this information through a website (www.adene.pt/sgcie) to the Directorate General of Energy and Geology (DGEG) from the Ministry of Environment, Spatial Planning and Energy, as well as through the submission of biennial execution and progress reports.

23.1.3 Monitoring and verification process

Considering the implementation and assessment of the SGCIE, it will be reviewed to expand its scope of application, as well as to improve the level of monitoring of energy consumption or incentives to encourage companies to adopt such actions voluntarily. The monitoring of the implementation of the

measures and energy efficiency will also be improved by using measurement and verification protocols.

This review of the SGCIE also aims to encourage companies to adopt European standards for energy management systems (e.g. ISO 50001).

There are no specific targets being set for the implementation of the monitored and verified energy efficiency measures on annual basis. The measurement of the achieved energy savings is performed through various forms including the submission of evaluation reports within the mandatory schemes for intensive consumers (industry and transport), the provision of data by industry associations (e.g. windows, solar thermal, electrical equipment, appliances and office supplies), the conduction of periodic surveys (domestic sector, industry, services and energy production) the collection of data from specific observatories (energy efficiency in public administration), the conduction of audits (buildings), etc.

The necessary verification procedures are performed by the Directorate General of Energy and Geology.

The monitoring of this system is performed through progress reports, which have to be presented every 2 years. Penalties are foreseen for those who won't fulfil the targets.

Energy audits, Energy Consumption Rationalization Plans and biennial execution and progress reports have to be elaborated by auditors recognized by DGEG according to their academic education and professional experience. This is regulated in a specific legislation (Ordinance n.º 519/2008, of June 25th) and until the end of 2013 there are 492 auditors recognized.

24 Romania[68]

The government of Romania opted not to implement an energy efficiency obligation scheme (to avoid potential increase of consumer prices), instead decided to introduce a range of alternative policy measures. Policy measures reported in the official EC notification of Romania are:

- Establishment of an energy efficiency investment fund (tapping into private funds, structural funds, auctioning revenues under EU ETS provisions and possibly the state budget)
- Conducting energy audits
- Training of energy auditors
- Regulations or voluntary agreements
- Supporting the development of ESCOs and awareness-raising.

The notification however does not contain detailed information of these measures. Based on the consultation with Romania ministry officials we selected two of the most important measures relevant for the industrial sector.

24.1 Energy management based on systematic energy audits

24.1.1 Short description of the measure

The Romanian energy management system is currently in the development phase. The plan is to carry out systematic energy audits that will be conducted by internal experts or energy auditors. The energy audits will also be the subject of quality assessments.

Type of policy measure	Regulatory
Lifetime of the measure	2014 - ongoing
Target groups	Industry, buildings and cities
Target technology	Not specified yet
Target energy savings	Not specified yet

Table 54. Main features of the Romanian audit scheme

[68] Information on measures in Romania were obtained from the official EC notification of Romania (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

24.1.2 Energy saving calculation (methods) and data requirements

For savings larger than 1000 toe the following documents need to be provided:

- a contour energy audit every 4 years
- a total energy consumption declaration every year and
- a questionnaire of energy analysis of the energy consumer.

For savings smaller than 1000toe only the 4 year energy audit and the yearly total energy consumption declarations need to be presented.

The data required for the energy saving calculations in the industrial, transport, household and service sectors include

- the primary energy consumption
- the total final energy consumption
- the final energy consumption.

24.1.3 Monitoring and verification process

The monitoring and verification scheme for energy efficiency measures is currently being implemented in Romania. The administrative authority for this process is the energy regulator (National Energy Regulatory Authority; ANRE) of Romania in cooperation with the Energy Efficiency department of the Ministry of Economic Affairs. ANRE is also responsible for setting up and managing a national database that constitute the main data sources for the monitoring of implemented measures.

There are no requirements for the verification process and no specific targets are established for the implementation of the monitored and verified for the energy saving measures.

24.2 Analysis of the potential for introducing energy efficient equipment, both in heavy industry and within SMEs

24.2.1 Short description of the measure

The details of this measure are not yet specified. The main goal is to stimulate the installation of energy efficiency equipment in the heavy industry and SME sectors and analyse the potential of these installations.

24.2.2 Energy saving calculation (methods) and data requirements

Calculation methods are not yet known but the main technical characteristics of the installed equipment will be essential input data for future calculations.

24.2.3 Monitoring and verification process

The owner of the equipment is required to provide every year the declaration of the total annual energy consumption to ANRE.

24.3 Covering the costs of energy auditing for SMEs

24.3.1 Short description of the measure

This measure aims to provide financial support for SMEs to cover the cost of an energy audit.

Type of policy measure	Legislative/Financial
Lifetime of the measure	2014 - ongoing
Target groups	SMEs
Target technology	Not specified yet
Target energy savings	Not specified yet

Table 55. Main features of the Romanian audit scheme

24.3.2 Energy saving calculation (methods) and data requirements

The Ministry of Economy - Department for SME, Business Environment can establish support schemes for SME's, in order to cover the cost of an energy audit and to costs of and the cost-effective implementation of recommendations made after energy audits , if the proposed measures are implemented , in compliance with state aid legislation .

24.3.3 Monitoring and verification process

Monitoring and verification is the responsibility of ANRE.

25 Slovakia

Having assessed the options for achieving the objective of saving energy and the impact of such measures, the Slovak Ministry of Economic Affairs, as administrator of the Directive, suggests combining the possibilities offered by the mandatory scheme and political measures, i.e. an EEO scheme and alternative measures.[69]

25.1 Mandatory energy efficiency scheme

25.1.1 Short description of the measure

No information.

Type of policy measure	EEO
Lifetime of the measure	Not specified
Target groups	Electricity, gas, and heat suppliers
Target technology	Not specified
Target energy savings	Not specified

Table 56. Main features of the Slovakian Mandatory energy efficiency scheme

25.1.2 Energy saving calculation (methods) and data requirements

No information.

25.1.3 Monitoring and verification process[70]

In Slovakia a M&V scheme for energy efficiency measures is currently implemented as adopted by the Energy Efficiency Act no. 321/2014. The M&V scheme is in compliance with the requirements of the corresponding EU legislation, while it was set up during the transposition of the Directive 2006/32/EC (ESD) aiming at the monitoring of National Energy Efficiency Action Plans.

[69] Information on measures in Slovakia were obtained from the official EC notification of Romania (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures).

[70] Information on the monitoring and verification process in Slovakia has been obtained from the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

The measurement of the achieved energy savings is performed with bottom up approaches. The implementation of these bottom-up approaches is performed through specific information systems. Regarding the measurement of the achieved energy savings in the industrial sector, the ITMS system is utilised, which is verified by the Ministry of Transport, Construction and Regional Development according to metered indicators. Similarly, for the case of interventions in the public sector metered indicators are determined for the monitoring of the energy efficiency measures.

25.2 Operational Programme Competitiveness and Economic Growth

25.2.1 Short description of the measure

On 28 November 2007, the European Commission approved an Operational Programme for the Slovak Republic for the period 2007-2013, entitled "Competitiveness & Economic Growth". The overall objective of the Programme is to maintain and foster the competitiveness and efficiency of industrial production and the energy sector, as well as the potential of tourism and other selected services, while respecting the conditions of sustainable development.

A key priority is the energy sector, aiming to increase energy efficiency in production, transport and consumption of energy; decrease energy intensity in industrial production consumption of primary energy sources; and increase exploitation of renewable energy.

Type of policy measure	Operational programme
Lifetime of the measure	Until 2020
Target groups	Private sector, Industry
Target technology	Not specified
Target energy savings	Not specified

Table 57. Main features of the Operational Programme Competitiveness and Economic Growth

25.2.2 Energy saving calculation (methods) and data requirements

No information.

25.2.3 Monitoring and verification process

No information.

25.3 Energy audits of businesses

25.3.1 Short description of the measure

No information.

Type of policy measure	Energy audits
Lifetime of the measure	?
Target groups	Private sector, Industry
Target technology	Not specified
Target energy savings	Not specified

Table 58. Main features of the Slovak energy audits scheme

25.3.2 Energy saving calculation (methods) and data requirements

No information.

25.3.3 Monitoring and verification process

No information.

26 Slovenia[71]

The ultimate goal of Slovenia is to achieve a cumulative end-use energy saving target of 1.5% of the annual energy sales (compared to average sales between 2010 and 2012) to final customers of all energy distributors or all retail energy sales companies by volume in the period of 2014-2020. Alternatively, the target may be achieved gradually, having 1% of savings in 2014 and 2015, 1.25% from 2016 to 2018 and then 1.5% in 2020. 1The obligation is planned to be assigned by a governmental decree with a 50-50% share to two measures, namely the Energy efficiency obligation scheme for energy suppliers and the Eco Fund,[72] the Slovenian Environmental Public Fund (described below).

The main measures that energy suppliers and Eco Fund may implement will be defined by legislation and will include the following:

- efficient energy use measures and greater use of renewables in heat generation in the public and service sectors and for industry and households
- efficient energy use measures in buildings
- efficient energy use measures in transport
- measures to increase the efficiency of district heating systems
- energy survey programs.

Furthermore, there is a provision for exceptions to allow primary energy savings achieved in the energy transformation, distribution and transmission sectors, including efficiency district heating and cooling infrastructure, to be counted towards the amount of energy savings.

26.1 Energy efficiency obligation scheme (linked to Eco Fund)

26.1.1 Short description of the measure

The Slovenian energy efficiency obligation scheme for energy sales companies was established by the new Energy Act (EZ-1) which entered into force in 2014. According to this scheme, energy suppliers

[71] Information on measures in Slovenia were obtained from the official EC notification of Slovenia (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and the D2.1.1 report of the ENSPOL project (http://enspol.eu/results). Information on the EAO was obtained by the Slovenian partner APE, based on the Slovenian Energy Act, from 2014 and the Ordinance on Methodology and Contents of the Energy Audit, from 2016.

[72] https://www.ekosklad.si/information-in-english

are required to achieve energy savings among final customers by stimulating them to implement energy saving measures in the form of replacing old inefficient devices (e.g. old household appliances, bulbs) and improve house insulations. The costs of implementing the EEO scheme needs to be covered by the energy sales companies themselves since they have the flexibility in how to implement and finance energy efficiency measures.

To circumvent actual energy savings, obligated parties may dedicate a payment to the Eco Fund (described below) which is used to finance energy efficiency improvements. To fulfil their obligation, the amount of this payment must be equal to the product of the savings that was required to be achieved among final consumers and the costs of achieving the Eco Fund energy savings.

Type of policy measure	Obligation
Lifetime of the measure	2015 - ongoing
Target groups	Energy suppliers
Target technology	Not specified yet
Target energy savings	0.75% per year, amounting to 262 GWh per year

Table 59. Main features of the Slovenian EEO scheme

26.1.2 Energy saving calculation (methods) and data requirements

The calculation method is established by the Ministry of Infrastructure and is based on the regulation called *Regulation on methods for determining the energy savings to end consumers*.[73] The basis of the calculation of savings is the annual average final energy consumption for the period of 2010-2012, excluding non-energy use and energy use in transport. Data from energy suppliers are collected by the Energy Agency.

26.1.3 Monitoring and verification process

The Energy Act states that the Slovenian Energy Agency is the responsible body for reporting and verifying the energy savings. Obligated parties are annually required to send to this Agency a report on the achievements of targets that will be used by the Agency to publish a report on all energy savings per each party achieved in the previous year.

Obligated parties need to also submit aggregate statistical data on their final consumers once a year on the Agency`s request.

[73] UL RS, No 67/15; http://www.uradni-list.si/1/objava.jsp?sop=2015-01-2730

In case obligated parties do not fulfil their obligations (do not achieve the target or do not make payments to the Eco Fund), or fail to report to the Agency, penalties will be issued according to the Energy Act.

The methodology for the statistical verification of savings is still in the design phase while the current methodology of energy savings is prescribed for standard measures (deemed savings). The methodologies will be updated regularly according to new measures on the market.

26.2 Eco Fund`s financial contribution scheme

26.2.1 Short description of the measure

The new Energy Act has also established the need for a financial contribution scheme to increasing energy efficiency. The Act requires the Eco Fund to develop and implement a national program that would provide financial incentives for investments in energy efficiency measures. The amount of the contribution per kilowatt hour of energy is planned to be set by a governmental decree and collected annually. Consumers need to pay this contribution on top of the energy or fuel prices since it is charged on the prices on district heating, electricity and solid, liquid and gaseous fuels. Contributions are then transferred by the operators or suppliers of energy and fuel to the Eco Fund.

Type of policy measure	Financial
Lifetime of the measure	Established in the new Energy Act that entered into force in 2014
Target groups	Industry, households, transport, service and buildings
Target technology	Not specified (energy efficiency measures)
Target energy savings	0.75% per year, amounting to 262 GWh per year

Table 60. Main features of the Slovenian Eco Fund

26.2.2 Energy saving calculation (methods) and data requirements

Calculations of savings are carried out similarly to the calculations used for the EEO scheme while the data are collected by Eco Fund.

26.2.3 Monitoring and verification process

The Energy Act states that once a year on its website, Eco Fund will publish a report on program implementation, energy savings achieved, amount of funds used to implement the program and specific costs for achieving savings.

26.3 Energy Audit Obligation scheme (EAO)

26.3.1 Short description of the policy measure

The Slovenian Energy Act from 2014 has introduced an EAO to contribute to the implementation of Article 7 of the EED for big companies, as defined in the national categorisation. The big companies are those, which have more than 250 employees, yearly income higher than 40 mio EUR or have the balance value higher than 20 mio EUR. The EAO has to be implemented every 4 years. Based on the Energy Act the ministry responsible for energy issued in 2016 The Ordinance on Methodology and Contents of the Energy Audit. The big companies are obliged to perform the Energy Audit by 31.12.2017.

The Energy Audit has to be made according the standard ISO 50002, or the series of standards EN 16 247. It is counted that the EAO is performed if the company is implementing the energy management according the standard EN ISO 50001 or implements the system of environmental management, according the standard EN ISO 14001 and elaborates the minimal Energy Audit every 4 years. The Energy Agency defines with the declaration, if the requirements regarding the EAO are satisfied. On the request of the interested company, which has to prove that the intention of the EAO was achieved with other allowed measures, the Energy Agency can also recognise the exempt regarding the EA.

Type of policy measure	Obligation
Lifetime of the measure	2016-without limitation
Target groups	All industrial sectors
Target technology	No restrictions
Target energy savings	Not specified

Table 61. Main features of the Slovenian audit scheme

27 Spain

27.1 Energy Efficiency Obligation (EEO) Scheme[74]

27.1.1 Short description of the measure

The Spanish EEO scheme will be implemented in two phases. During the first implementation phase, the certification mechanism will not be implemented and no energy efficiency actions will take place. Instead all the obligated parties will comply the EEO scheme by paying a financial equivalent with the energy saving they are obliged to bring about to the National Energy Efficiency Fund.

After the first "trial" period, the obligation's fulfilment is expected to be based on tradable energy saving certificates associated with a catalogue of measures and savings related to the energy efficiency actions.

Type of policy measure	Obligation
Lifetime of the measure	2014 - 2020
Target groups	Electricity, gas and oil retailers, including transport (with the exception of small retailers)
Target technology	Not specified
Target energy savings	6356 ktoe

Table 61. Main features of the Spanish EEO

27.1.2 Energy saving calculation (methods) and data requirements

The above mentioned cumulative target is calculated as the sum of annual figures for the seven year period, each produced by multiplying the annual average consumption of final energy in the industry and multi-purpose sectors for the years 2010, 2011 and 2012 by an incremental annual coefficient of 1.5%, i.e. 1.5% in the year 2014, 3.0% (1.5% + 1.5%) in 2015 and so on, successively, up to 10.5% in the year 2020. This is equivalent to 571 ktoe/ year, considering a linear distribution over the commitment period.

[74] Information on the Spanish EEO has been obtained from the official notification to the EC by Spain (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures), the D2.1.1 report of the ENSPOL project (http://enspol.eu/results) and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

The saving target will be distributed over the obligated parties also on a linear basis over the entire period of the obligation. The saving target for all obligated parties will be set annually, according to their market shares, using as baseline information for the initial distribution the sales in the financial year 2013. This information will be provided by the companies themselves. In successive annual periods, the baseline information for distribution of the targets will be the sales in year n-2. The obligations to which energy sellers operating in Spain will be subject under Article 7(1) of Directive 2012/27/EU will be calculated by applying the market share of each retailer and wholesale trader to the previous savings target. The savings obligations will be set in terms of final energy.

The baseline information for the initial distribution of the targets by sources will be the sales from the 2012 financial year of each and every one of the retailers of these energies that surpass the threshold; in successive years, the baseline information for the distribution of targets will be the sales from the year n-2. The obligations, to which the energy retailers operating in Spain will be subject, pursuant to Article 7(1) of Directive 2012/27 /EU, will result from applying the market shares of each retailer to the previous saving target. The savings obligations will be set in terms of final energy and expressed in GWh.

The main data sources for monitoring the implemented energy efficiency measures in different sectors include national databases, databases on regional level and data from paid subsidies.

27.1.3 Monitoring and verification process

During the first implementation phase of the scheme, verification and monitoring actions will not be necessary, since compliance with the scheme will be imposed automatically through the financial payments by the obligated parties to the Energy Efficiency Fund.

In case those certificates become effective, as already mentioned, at the beginning of each year the obligated parties should select either to comply with their obligations by obtaining saving certificates or to pay an equivalent amount to the Energy Efficiency National Fund. The obligated parties conforming to their obligations would, at the end of the year, provide the Ministry of Industry, Energy and Tourism (IDEA) with the energy efficiency certificates accrediting sufficient fulfilment of the defined by law obligation, otherwise they should pay an equivalent amount to the Energy Efficiency National Fund.

Specialized bottom-up monitoring approaches are utilized in order to measure the achieved energy savings from the implemented energy efficiency measures. The development of the bottom-up approaches has been performed according to the proposed methods of ANNEX V of the EED.

As managing authority of the energy efficiency obligation scheme, the IDAE is responsible to inspect and supervise the proper implementation of the energy saving and efficiency measures. The IDAE verifies the implemented energy efficiency measures in order to issue energy efficiency certificates for the obligated parties with the prerequisite that there is the evidence that the measure has led to the final consumers the specific amount of energy savings. The IDAE may be supported from external entities or specialists in order to complete the appropriate verification procedures.

The energy efficiency and savings measures entitled to have energy efficiency certificates issued for an amount equal to the energy savings must be included in the catalogue (table of measures). Once completed, the catalogue will include the estimate of the savings (ex-ante) that will be accepted from the companies for implementing each of the actions included therein, as well as the full list of the supporting documentation that the companies must submit to IDAE to request the issuing of the energy efficiency certificates that may apply to them. IDAE may have support from specialist external entities to verify the proper implementation of the energy efficiency measures by energy service companies and/or obligated parties.

Accredited members of the scheme must obtain final consumers' explicit agreement to the action promoting, supporting and/or funding investment in energy saving and efficiency measures. It will be that investment which will entitle accredited persons (as participating parties) to receive energy efficiency certificates for the resulting savings.

27.2 Action Plan 2011-2020: Establishment of energy management systems[75]

27.2.1 Short description of the measure

This Action Plan 2011-2020 makes up the second National Energy Efficiency Action Plan (NEEAP) which, pursuant to article 14 of Directive 2006/32/EC of the European Parliament and of the Council, of 5th April 2006, on energy end-use efficiency and energy services. The Action Plan 2011-2020 presents a set of measures and actions coherent with the end-use and primary energy consumption scenarios included in other planning instruments, in terms of renewable energies and planning in the gas and electric power sector.

The measures to be implemented as part of the Action Plan and the EEO for the industry sector are:

- Energy Audits (SPA19)
- Improvement in the technologies of equipment and processes (BAT) (SPA20)
- Establishment of energy management systems (SPA22)

Type of policy measure	Financial, legislative/informative
Lifetime of the measure	2011-2020
Target groups	Multiple sectors including

[75] Information on the Spanish EEO has been obtained from the official notification to the EC by Spain (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures) and from the website of MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/industry/SPA22.PDF)

Type of policy measure	Financial, legislative/informative industry
Target technology	Not specified
Target energy savings	4489 Mtoe final energy for 2020 in the industry sector (equivalent to 25% of the total energy saving) 335 ktoe annual final energy saving in 2020 for SPA22

Table 62. Main features of the Spanish Action Plan

The objective of the Energy management System is the establishment of measurement and control elements, as well as analysis systems of the production process variables.

The measure means to establish the necessary mechanisms to establish energy management systems. The action mechanisms that will make the envisaged saving objectives possible will be mainly of legislative nature, such as policy and regulatory developments to establish a favourable framework to consolidate and implement the best technological improvements aimed for.

This measure is aimed at the titleholders of all the energy-consuming industrial installations, inclusive all the activity associations that make up the Industry Sector.

27.2.2 Energy saving calculation (methods) and data requirements

The measures included in this Action Plan 2011-2020 will involve savings of final energy for 2020 worth 17,842 ktoe and of primary energy worth 35,585 ktoe, calculated with reference to year 2007 and in accordance with the methodology proposed by the European Commission. Savings, in terms of primary energy, includes the savings derived from the measures proposed for the Energy Transformation Sector in this Plan – mainly on promotion of co-generation – and the ones derived from the change in the generation mix stimulated by other planning actions in terms of energy policy not involved with it, and which respond to the obligations derived from Directive 2009/28/EC, of 23rd April 2009, on the promotion of the use of energy coming from renewable sources. The former savings, in terms of primary energy, equals 20% of the primary energy consumption that would have taken place in 2020 for lack of the renewable energy diversification and promotion policies approved by the Spanish government and this Action Plan 2011-2020. In terms of final energy, saving in 2016 amounts to 13,176 ktoe, which equals 12.2% of final energy in that year, for lack of the Plan. This saving, once discounted the non-included sectors in the field of application of Directive 2006/32/EC, amounts to 11,532 ktoe in 2016, which involves 15.9% of the average consumption in the five last years prior to the enforcement of the Directive, and subsequently the fulfilment of the saving objectives demanded by Directive 2006/32/EC. Additionally, the Action Plan 2011-2020 is coherent with the global objectives agreed on by the European Council of 17th June 2010, in relation to the improvement of primary energy efficiency by 20% in 2020.

27.2.3 Monitoring and verification process

The responsible bodies of the implementation and follow-up of the measure are the IDAE, in collaboration with the Autonomous Communities.

27.3 JESSICA – FIDAE Fund[76]

27.3.1 Short description of the measure

The Investment Fund for Energy Diversification and Saving (F.I.D.A.E.) is a EUR 123 million JESSICA (Joint European Support for Sustainable Investment in City Areas) holding fund designed to finance urban projects relating to energy efficiency and the use of renewable energy. It was set up as the result of a funding agreement signed between the European Investment bank (EIB) and the Institute for Energy Diversification and Saving (IDAE) on 1 July 2011. The fund was operational from April 2013 until December 2015.

The eligible measures must form part of one of the following four priority themes:

- Solar (Priority Theme 40) Thermal solar installations for thermal energy generation. Isolated solar photovoltaic installations.
- Biomass (Priority Theme 41) Installations for thermal energy generation. Biofuel production. Installations to process biomass for energy purposes (grinding, chipping, pellet manufacture, etc.). Pump installations at biofuel filling stations, etc.
- Energy saving and efficiency projects (Priority Theme 43) Energy saving and performance in buildings. Renovation or extension of existing heating or cooling systems. Energy saving and efficiency projects in the industrial sector, etc.
- Clean transport (Priority Theme 52) Electric and hybrid electric vehicles including cars, motorcycles and bicycles. Electric and hybrid buses. Charging infrastructure for plug-in electric or hybrid vehicles. Regenerative braking equipment (trains, trams, underground trains, etc.). Management of fleets which demonstrate energy saving, etc.

Type of policy measure	Financial
Lifetime of the measure	2013-2015
Target groups	Industry, building, transport and energy-related public service infrastructure sectors
Target technology	Solar, biomass, clean transport and energy efficiency

[76] Information on the Spanish EEO has been obtained from the official notification to the EC by Spain (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures).

Type of policy measure	Financial
	projects
Target energy savings	32.5 ktoe cumulative (2014-2020)

Table 63. Main features of the Spanish FIDAE Fund

27.3.2 Energy saving calculation (methods) and data requirements

The calculation methodology used to determine the savings under this measure will be that known as 'ex ante or deemed savings, by reference to the results of previous independently monitored energy improvements in similar installations' established in point 1 a) of Annex V to Directive 2012/27/EU.

27.3.3 Monitoring and verification process

Under the EC Regulations, monitoring includes activities carried out internally and externally by various actors in a cascade structure, ensuring that implementation of each phase is also monitored by a higher level actor. Decision-making and actions are performed by the European Commission, the managing authority, the IDAE, the holding fund manager, the UDF manager and the project owners/beneficiaries.

The IDAE is responsible for monitoring the processes in the following cascade levels, including therefore the processes of selecting UDFs, project selection and financing, verification under Article 13 of Regulation (EC) No 1828/2006 and the settlement of contracts and conclusion of the UDF-funded projects themselves.

The monitoring actions enable the IDAE to verify that:

- JESSICA is executed in accordance with all applicable national and European Union requirements and rules and includes the necessary 23 resources to gather the information relevant under those rules
- The targets for the Fund are being achieved.

The IDAE, in turn, provides the managing authority with any relevant information the latter requests in order to comply, in turn, with its own monitoring obligations.

The fund manager must also carry out an administrative verification of 100% of operations and must certify or carry out on-the-spot verifications of a sample of operations representing at least 25% of the total eligible expenditure of the entire group of operations financed, including at least on-site verification of one operation for each priority theme in each verification period.

28 Sweden

28.1 Energy taxes and CO_2 taxes[77]

28.1.1 Short description of the measure

Sweden implements taxes on energy and carbon dioxide, following the Swedish Energy Tax Act of 1994. The tax rates are not fixed over time but are reviewed and amended annually through an index - linked scheme which takes into consideration any changes in the consumer price index. This maintains the control signal given by the taxes over time.

The level of tax rate depends on the fuel used and is summarised in the EC notification. The tax rates are not fixed over time but are reviewed and amended annually through an index-linked scheme which takes into consideration any changes in the consumer price index.

Type of policy measure	Fiscal
Lifetime of the measure	Since 1994
Target groups	Crosscutting
Target technology	Not specified
Target energy savings	Not specified

Table 64. Main features of the Swedish energy and CO_2 taxes

28.1.2 Energy saving calculation (methods) and data requirements

Energy savings that can be credited are the savings that are made as a result of the price difference arising in cases where Swedish tax levels are higher than the EU's minimum tax levels for both energy tax and value added tax. A somewhat simplified calculation of the energy saving can be performed by multiplying the price difference in connection with price elasticity and energy consumption.

In order to calculate the effect of the taxes, the energy savings made during the period 2014 to 2020 must be evaluated counterfactually, i.e. compared on the basis of the alternative scenario that as of 1 January 2014, the tax levels were lowered to the EU's minimum tax levels.

[77] Information on the Swedish energy and CO_2 taxes has been obtained from the official notification to the EC by Sweden (https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_sweden.pdf), the D3.1 report of the ENSPOL project (http://enspol.eu/results), and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

28.1.3 Monitoring and verification process

The scheme is monitored by the Swedish tax agency.

28.2 Energy audit checks[78]

28.2.1 Short description of the measure

Companies with energy consumption in excess of 500 MWh per year can apply for financial support to carry out an energy audit. The support covers up to 50% of the cost of an energy audit, subject to a maximum of SEK 30 000. This aims to eliminate any lack of awareness by conducting an audit of the company's energy consumption, and promoting the implementation of potentially profitable energy efficiency measures.

Type of policy measure	Regulations and voluntary agreements
Lifetime of the measure	Since 2009
Target groups	Industrial sector
Target technology	Support to carry out an energy audit
Target energy savings	0.5 TWh

Table 65. Main features of the Swedish energy audit checks

28.2.2 Energy saving calculation (methods) and data requirements

The data are collected by national databases, while the Ministry of Energy is responsible for the data collection process and for the development of the methodology with the utilised indicators. Top-down approaches are used according to the recommendations by the EC in accordance with ESD. The evaluation of energy efficiency measures is based on bottom-up methodologies. Nevertheless, for the case of households and services it has been decided to change the calculation method from bottom up to top-down.

[78] Information on the Swedish energy audit checks has been obtained from the official notification to the EC by Sweden (https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_sweden.pdf), the D3.1 report of the ENSPOL project (http://enspol.eu/results), and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

28.2.3 Monitoring and verification process

Companies receiving support have to report on the energy efficiency measures they have implemented and the effects thereof to the Swedish Energy Agency. Sweden has already developed and implemented a M&V-scheme for the monitoring of the implemented energy efficiency measures at national, regional and local level. A combination of top-down and bottom up methods has been used for the effective measurement of the achieved energy savings.

28.3 Program for energy efficiency in industries (PFE)[79]

28.3.1 Short description of the measure

The program for energy efficiency in energy-intensive industries (PFE) aims to promote energy efficiency among energy-intensive industrial companies. Participation is voluntary, and participating companies receive an exemption from the energy tax on electricity of SEK 0.005 (*0.5 öre*) per kWh (approximately EUR 0.0005/kWh) used in the manufacturing process.

The guidelines for government support for environmental protection announced in 2008 have restricted the scope to grant tax exemptions to companies. As a result, the Program for Improving Energy Efficiency Act was repealed in 2012 and therefore companies can no longer join the program. The provisions of the repealed Act still apply to companies that joined up until 2012. The majority of program participants will leave the PFE program on 30 June 2014, and the companies that joined last will leave in 2017.

In order to join the program, a participating company had to meet any criteria that are set regarding energy intensity, use electricity in the manufacturing process, and be assessed as able to implement any measures arising as a result of participating in the program. The company performs an energy audit, introduces a certified energy management system, introduces special routines, and implements energy efficiency improvement measures.

Type of policy measure	Financing schemes or instruments or fiscal schemes (voluntary scheme)
Lifetime of the measure	2005-2017
Target groups	Industrial sector
Target technology	Introduction of an energy management system, perform

[79] Information on the Swedish PFE scheme has been obtained from the official notification to the EC by Sweden (https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_sweden.pdf), the D3.1 report of the ENSPOL project (http://enspol.eu/results), and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

Type of policy measure	Financing schemes or instruments or fiscal schemes (voluntary scheme)
	of energy audits, special routines introduction and electricity efficiency improvement measures implementation
Target energy savings	Not specified

Table 66. Main features of the Swedish PFE scheme

28.3.2 Energy saving calculation (methods) and data requirements

The data are collected by national databases, while the Ministry of Energy is responsible for the data collection process and for the development of the methodology with the utilised indicators. Top-down approaches are used according to the recommendations by the EC in accordance with ESD. The evaluation of energy efficiency measures is based on bottom-up methodologies. Nevertheless, for the case of households and services it has been decided to change the calculation method from bottom up to top-down.

28.3.3 Monitoring and verification process

The company must report to the Swedish Energy Agency on three occasions during the period. Sweden has already developed and implemented a M&V-scheme for the monitoring of the implemented energy efficiency measures at national, regional and local level. A combination of top-down and bottom up methods has been used for the effective measurement of the achieved energy savings.

28.4 Network management in industry[80]

28.4.1 Short description of the measure

The Swedish Energy Agency promotes the formation of operator networks in industry. The purpose of the networks is to raise awareness of how to make energy consumption more efficient. Networks have for example been formed in the mining and steel industries, material processing industries, and the sawmill industry. For example, the network for energy efficiency in the Swedish manufacturing

[80] Information on the Swedish industry network management has been obtained from the official notification to the EC by Sweden (https://ec.europa.eu/energy/sites/ener/files/documents/article7_en_sweden.pdf), the D3.1 report of the ENSPOL project (http://enspol.eu/results), and the D1.2 report of the multEE Project (http://multee.eu/content/synthesis-report-mv-schemes-and-coordination-mechanisms-eu-Member States).

industry (ENIG) was started in 2009, and aims to reduce the companies' energy consumption by 5% per year. The network in the sawmill industry (EESI) started in 2010, and aims to reduce the energy consumption by at least 20% by 2020.

Type of policy measure	Regulations or voluntary agreements and training and education
Lifetime of the measure	Since 2009
Target groups	Industrial sectors
Target technology	Not specified
Target energy savings	Not specified

Table 67. Main features of the Swedish network management in industry

28.4.2 Energy saving calculation (methods) and data requirements

The data are collected by national databases, while the Ministry of Energy is responsible for the data collection process and for the development of the methodology with the utilised indicators. Top-down approaches are used according to the recommendations by the EC in accordance with ESD. The evaluation of energy efficiency measures is based on bottom-up methodologies. Nevertheless, for the case of households and services it has been decided to change the calculation method from bottom up to top-down.

28.4.3 Monitoring and verification process

Sweden has already developed and implemented a M&V-scheme for the monitoring of the implemented energy efficiency measures at national, regional and local level. A combination of top-down and bottom up methods has been used for the effective measurement of the achieved energy savings.

29 United Kingdom

29.1 Climate Change Agreements (CCA)[81]

29.1.1 Short description of the measure

Climate Change Agreements (CCAs) set the terms under which eligible energy-intensive industries can claim a discount on the Climate Change Levy (CCL), provided they set and meet an overall sector target for improving their energy efficiency or reducing their carbon emissions. There are 51 umbrella CCAs with trade bodies representing energy-intensive business sectors. CCA targets are aimed at achieving the same level of energy savings that would have occurred if CCA sectors were subject to the full CCL.

Sector organisations negotiate CCAs with the Environment Agency, committing to sector specific energy efficiency/carbon intensity goals. Businesses can then sign up to their sector's CCA and in return receive a rebate of Carbon Reduction Commitment (CRC) and CCL costs on their energy consumption. If businesses fail to meet their targets they can make up for the gap in savings by purchasing carbon credits from the government at GBP 12/ton of carbon.

CCAs are not technology-specific. In the agreements, the overall energy consumption of a business or site is considered, and any way of reducing this is valid.

Type of policy measure	Financial (voluntary)
Lifetime of the measure	2014-2023
Target groups	Industrial energy-intensive sectors
Target technology	Not technology-specific
Target energy savings	20 TWh (2014-2020)

Table 68. Main features of the CCA scheme in the UK.

29.1.2 Energy saving calculation (methods) and data requirements

Savings from this policy are considered deemed savings. CCA targets are aimed at achieving the same level of energy savings that would have occurred if CCA sectors were subject to the full CCL. It has not been possible to provide a reliable estimate of the full extent of what CCAs will save prior to an

[81] Information on the Climate Change Agreements (CCA) scheme was obtained from the official EC notification by the United Kingdom (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures).

evaluation of the scheme. As a result the following approach has been adopted: In the absence of CCAs, consumers would be required to pay the full rate of the CCL on their energy consumption and therefore the initial estimate of savings assumes the same level of energy savings as if these consumers paid the full CCL. These savings have been calculated using a price elasticity of demand relative to the Energy Taxation Directive (ETD).

All companies covered by a specific CCA must report either the energy use for the target unit, or the total number of units of carbon emitted by the target unit. The operator of the target unit must collect the individual facility energy consumption and throughput data and then use this information to report against its target unit target, using energy and throughput data for all the facilities contained within the target unit's underlying agreement. These data may be reported as either an aggregate for the target unit, or individually for each facility.

29.1.3 Monitoring and verification process

The scheme is currently monitored and verified every two years in milestone reviews by the Environment Agency. Monitoring of savings is done via 'Target period reporting' by the individual businesses, which report their relevant energy performance. The Environment Agency carries out audits on selected target unit operators and sector associations through the lifetime of the scheme to verify eligibility and performance. This follows a mixed risk based and random selection approach. However, savings are not related to specific measures/investments/technologies, but only reported for the entire target unit (i.e. sites or businesses).

29.2 Energy Saving Opportunity Scheme (ESOS)[82]

29.2.1 Short description of the measure

The Energy Saving Opportunity Scheme (ESOS) requires all large (non-SME) businesses to conduct comprehensive energy audits of their buildings, industrial processes, and fleet operations, and notify the Energy Agency of compliance. There is no obligation for the implementation of identified measures. Since ESOS is a regulation, rather than a supplier obligation, it does not have an end date. The first intermediate obligation period for conducting ESOS assessments was December 2015, and a second intermediate obligation will be December 2019.

Energy audits carried out for/by non-SMEs in scope of the regulation will result in recommendations being made to those organisations of measures that could be taken in order to make energy savings.

[82] Information on the Energy Saving Opportunity Scheme (ESOS) was obtained from the updated official EC notification by the United Kingdom (https://ec.europa.eu/energy/en/topics/energy-efficiency-directive/obligation-schemes-and-alternative-measures).

The nature of the recommended measures will depend on the nature of the audited organisation's energy use.

Type of policy measure	Regulation and agreements
Lifetime of the measure	First compliance date was 5 December 2015
Target groups	Cross-cutting measure; non-domestic sector (non-SME enterprises)
Target technology	All energy-saving options identified in the audit
Target energy savings	Estimated savings of 15 TWh (2014-2020)

Table 69. Main features of the ESOS scheme in the UK.

29.2.2 Energy saving calculation (methods) and data requirements

For ESOS, deemed savings (assumed percentage savings for energy use not covered already by other policy instruments) are used. These can be calculated based on a number of energy auditing methodologies such as, ISO 50002, BS EN 16247, etc. Key requirements for the energy audit include:

- It must be based on 12 months' verifiable data
- It must analyse the participant's energy consumption and energy efficiency; this must be done using energy consumption profiling. Energy consumption profiling involves breaking down the different ways in which energy is used by a participant's activities and assets and analysing any variations in energy use to identify inefficiencies.
- It must identify energy saving opportunities

Energy saving opportunities should be reasonably practicable and cost effective to implement. Recommendations should include the estimated costs and benefits of implementation. One should assess cost effectiveness by comparing the reduction in units of energy or energy spends with the cost of implementing the measure. Calculating the cost of implementing a measure should be based on an analysis of whether the investment will be economical over its entire life. This would include taking into account the cost of purchase, installation, maintenance and depreciation.

Energy consumption data used to analyse saving opportunities should be collated in kWh/volume of fuel. The data should be of sufficient quality to allow energy consumption profiling. Energy consumption profiling involves breaking down the different ways in which energy is used by a participant's activities and assets and analysing any variations in energy use to identify inefficiencies. The data must be for a continuous period, begin no earlier than 6 December 2010 for the first compliance period (and no more than 12 months before the start of future compliance periods), and begin no more than 24 months before the start of the energy audit.

29.2.3 Monitoring and verification process

Responsibility for monitoring and enforcing ESOS lies with an independent public body, the Environment Agency. ESOS participants need to provide a notification to the Environment Agency, that they have complied with the requirements of ESOS on or before the compliance date of each phase, through an online notification system. This ESOS Assessment has to be signed off by a company director or equivalent senior manager.

The data supplied to the Environment Agency only includes qualitative questions around the compliance process. Quantitative analysis, including specific recommendations for energy saving opportunities and business cases, are held by the businesses in their ESOS evidence packs. The Environment Agency audits a random sample of ESOS evidence packs for their compliance with the regulation, but no data from the packs is than centrally held and evaluated. Since the scheme also does not require businesses to implement any measures that were identified, no monitoring of savings after implementation is conducted.

29.3 Enhanced Capital Allowance (ECA) scheme[83]

29.3.1 Short description of the measure

The Enhanced Capital Allowance (ECA) scheme consists of three sub-schemes, focussing on (1) energy saving plants and machinery, (2) low carbon dioxide emission cars and natural gas and hydrogen refuelling infrastructure, and (3) water conservation plants and machinery. For the energy saving ECA, eligible technologies are on the Energy Technology List (ETL). The ETL is a government-managed list of energy-efficient plant and machinery. When businesses purchase equipment on the list they are able to claim 100% first year capital allowance on the product. The first year allowances let businesses set 100% of the cost of the assets against taxable profits in a single tax year. This means the company can write off the cost of the new plant or machinery against the business's taxable profits in the financial year the purchase was made. The ETL lists over 16,000 energy-saving products.

Type of policy measure	Financial, fiscal/tariffs
Lifetime of the measure	Since 2001
Target groups	Cross-cutting measure for businesses from all sectors

[83] Information on the ECA scheme was obtained from the website of MURE (http://www.measures-odyssee-mure.eu/public/mure_pdf/tertiary/UK11.PDF) and the UK government document titled 'The Enhanced Capital Allowance scheme for energy-saving technologies' (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/421006/ECA272_Capital_Allowance_v7_April_2015.pdf)

Type of policy measure	Financial, fiscal/tariffs
Target technology	(1) Energy-saving plants and machinery, (2) low-carbon cars and natural gas and hydrogen refuelling infrastructure, and (3) water conserving plants and machinery
Target energy savings	No estimates

Table 70. Main features of ECA scheme in the UK.

29.3.2 Energy saving calculation (methods) and data requirements

No specific savings are calculated. Inclusion of products into the ETL is based on product category specific criteria, e.g. regarding product design, efficiency, etc.

29.3.3 Monitoring and verification process

The scheme is managed by the Carbon Trust on behalf of Government and its Energy Technology Criteria List (ETCL) is updated annually to reflect the changing market for energy-saving technologies. No scale of implementation of different technologies is monitored. The government (HM Revenue & Customs) only holds a number of total amounts of capital investment claimed through the ECA every year, no breakdown of individual investments, or even distribution into different technology categories is held."

30 Comparative overview

In this report, an overview has been presented of the key energy efficiency policies for compliance to the Energy Efficiency Directive (EED) in the 28 EU Member States and Norway, which are relevant to the industrial sector. This includes both policy measures that are specifically designed for energy efficiency in industry, and more general crosscutting measures (e.g. energy taxes), that also have a profound impact on industries.

While in most Member States a wide range of policy measures has been implemented, in this report a selection has been made of the maximum four most relevant policy measures, based on their impact on industrial stakeholders, the expected resulting energy savings, and the innovativeness. This report has been completed through consultation with national policy makers and implementing agencies in each Member State.

30.1 Types of measures

Under the Energy Efficiency Directive (EED), Member States should set up an energy efficiency obligation scheme, or use alternative policy measures, to achieve yearly energy savings of 1.5% of annual sales to final consumers. Specifically when it comes to the industrial sector, more than half of the EU Member States (16) have implemented an industry-relevant energy efficiency obligation (EEO) scheme, of which most have combined this with alternative measures. For four Member States we have identified the EEO scheme to be the sole relevant energy efficiency measure for the industrial sector: Denmark, Hungary, Lithuania, and Luxembourg. The other EU Member States, and Norway, have not implemented an industry-relevant EEO scheme, and have thus focused on alternative measures only.

Table 71. Overview of types of measures by country. *Note that this overview only covers the measures that have been selected as being the most important per country.*

Country	EEO scheme	Financial support	Fiscal measure	Information/ training	Voluntary agreement	Legislative/ regulatory
Austria	✓ X	✓ X	✓ X	✓ X		
✓ Belgium	✓ X	✓ X			✓ X	
✓ Bulgaria	✓ X	✓ X	✓ X			✓ X
✓ Croatia		✓ X		✓ X	✓ X	
✓ Cyprus		✓ X		✓ X		
✓ Czech Rep.		✓ X				
✓ Denmark	✓ X					
✓ Estonia	✓ X	✓ X	✓ X			
✓ Finland		✓ X		✓ X	✓ X	
✓ France	✓ X	✓ X				
✓ Germany		✓ X	✓ X	✓ X		
✓ Greece		✓ X		✓ X		✓ X

Country	EEO scheme	Financial support	Fiscal measure	Information/ training	Voluntary agreement	Legislative/ regulatory
✓ Hungary	✓ X					
✓ Ireland	✓ X			✓ X		
✓ Italy	✓ X					✓ X
✓ Latvia	✓ X	✓ X				
✓ Lithuania	✓ X					
✓ Luxembourg	✓ X					
✓ Malta		✓ X	✓ X			
✓ Netherlands			✓ X		✓ X	
✓ Norway		✓ X		✓ X		
✓ Poland	✓ X					
✓ Portugal			✓ X	✓ X		
✓ Romania		✓ X				✓ X
✓ Slovakia	✓ X			✓ X		
✓ Slovenia	✓ X	✓ X				
✓ Spain	✓ X	✓ X		✓ X		
✓ Sweden		✓ X	✓ X	✓ X	✓ X	✓ X
✓ UK		✓ X	✓ X			✓ X

Within this report, a total of 71 measures have been considered as the most relevant energy efficiency policy measures for industry in the 28 Member States, plus Norway. It must be noted that this is not an overview of all policies implemented in the EU and Norway, but rather a subjective selection of the most important policies for industrial energy efficiency in those countries, based on discussions with national policy makers and literature and database findings on their effectiveness. The most-used type of policy measure for energy efficiency in industry is financial support, including for instance incentives for energy efficient equipment or energy management systems. This type of measure is among the key policies for 19 of the Member States. Other types of policy measures – information/training measures; fiscal measures; voluntary agreements; and legislative/regulatory measures – have been implemented by five to seven Member States each.

It must be clarified that for many of the policy measures, no clear classification in one of the abovementioned categories can be made. For example, many financing/support schemes include aspects of information or regulatory measures, and voluntary agreements are often combined with financing. These are mostly named as cross-cutting measures, which are the most frequent ones in addressing the various industrial sectors.

30.2 Energy savings calculations

Several methods can be used for the calculation of energy savings as a result of each policy measure in industry. There are four types of basic methodologies applied in MS:

- deemed savings (ex-ante defined, standard values based on previous monitoring);
- metered savings (ex post recording of the actual energy use reductions);

- scaled savings (based on engineering estimates); and
- surveyed savings (based on surveys; this approach is only to be used for measures on consumer behaviour, and is therefore usually not appropriate in the industry sector).

For energy efficiency obligation (EEO) schemes, a variety of methods is used in the various Member States depending often on the type of policy. In several Member States, it is stated that the method of deemed savings is preferred, because of its relative simplicity for participants who can pick measures from existing technology lists, which predetermine the savings that can be generated. However, it is also acknowledged that for more complex technologies and measures the deemed savings method is not appropriate. Therefore none of the Member States regard the deemed savings method as the only possible method. For example, France has an online database available of deemed savings, but for many industrial options either scaled or metered savings methods need to be applied. With this in mind, many Member States opt for a combination of scaled savings methods for simpler industrial options, and metered savings for the most complex options.

The Italian scheme uses a typical framework with three options for energy savings calculations for different complexities of the implemented projects: deemed savings for simple projects; simplified monitoring for more complex projects, and metered savings for the most complex projects. Simplified monitoring in this case refers to a combination of one or more meters (metered savings), and a calculation of the savings of the entire project based on these metered results and other parameters (scaled savings).

For financing measures (support schemes), metered savings methods are much less commonly used. The majority of Member States use a form of scaled savings methods for their support schemes, and some Member States only use a set of deemed savings. It also appears that scaled savings methods used here are simpler than those used for the EEO schemes, with for example for Germany's investment support programmes in companies simply assuming an energy saving value per amount of the investment. For instance, in the area of cross-cutting technologies and production processes, a saving of 0.75 kWh per year per euro invested was deemed a realistic value.

For the other types of energy efficiency policy measures, less general conclusions can be drawn, because these have been implemented by a smaller group of Member States. However, in general it appears that, as for the financing measures, the method of scaled savings has been the most commonly used.

30.3 Monitoring and reporting

Monitoring energy savings and achievements of targets are generally the responsibility of national ministries and occasionally of some kind of agencies (e.g. National Energy Agency) or independent public bodies.

Considering the different type of measures (obligation, financing and other), reporting protocols in the 29 studied countries might vary significantly. There are no monitoring schemes implemented yet in Lithuania, while they are currently being implemented in Romania and Slovakia. However, if we

look at the same type of measures in the other countries where monitoring schemes already exist, some similarities can be identified.

Obligations such as EEOs or certificate schemes are in most cases (with the exception of France and Hungary) monitored annually, where obligated parties need to provide an energy audit or draw up a summary report on energy savings. In France no annual reporting is in place, but random checks may be carried out up to 6 years after the completion of the measure, while in Hungary or Poland reporting will be obligatory in every 4 years.

Audits are usually carried out and verified by energy experts and in most cases energy auditors need to be accredited (e.g. certified and/or registered). They are mostly external but can also be internal experts provided they remain independent like for example in the case of Romania where audits may be conducted by such experts.

Financial measures are either monitored annually (via financial reporting or auditing) or by random checks or sampling. In the case of Greece, Sweden and the UK however monitoring takes place in every 6 months, 4 years and 2 years, respectively. For example in Greece, this means monitoring of the financed action by 6-month period with the submission of standardized reports and the quantification and monitoring of specific indicators. While in the UK monitoring and verification takes place in every 2 year following a mixed risk based and random selection approach.

For the other type of measures however it is rather challenging to draw an overall conclusion since they are quite different and have been implemented only by several countries. Voluntary agreements can be monitored and verified annually (e.g. in Finland and the Netherlands) or by using specific algorithms like in Croatia.

30.4 Databases of energy savings in the industrial sector

Through a consultation with various national authorities and implementing agencies, we have come up to a list of the countries that have datasets on industrial energy savings, as they are registered from either auditors or the companies (that have implemented these measures) themselves.

Country	Database
Austria	✓ Y
✓ Belgium	✓ Y
✓ Bulgaria	✓ Y
✓ Croatia	✓ Y
✓ Cyprus	✓ Y
✓ Czech Republic	✓ Y
✓ Denmark	✓ Y
✓ Estonia	✓ N
✓ Finland	✓ Y

✓ France	✓ Y
✓ Germany	✓ Y
✓ Greece	✓ N
✓ Hungary	✓ N
✓ Ireland	✓ Y
✓ Italy	✓ Y
✓ Latvia	✓ Y
✓ Lithuania	✓ N
✓ Luxembourg	✓ N
✓ Malta	✓ N
✓ Norway	
✓ Poland	✓ Y
✓ Portugal	✓ Y
✓ Romania	✓ N
✓ Slovakia	✓ Y
✓ Slovenia	✓ Y
✓ Spain	✓ Y
✓ Sweden	✓ Y
✓ The Netherlands	✓ Y
✓ UK	✓ Y